NASA 10th Anniversary

JOHN F. KENNEDY SPACE CENTER

A Summary of MAJOR NASA LAUNCHINGS

Eastern Test Range (ETR)

Western Test Range (WTR)

October 1, 1958 - September 30, 1968

Historical and Library Services Branch
John F. Kennedy Space Center
National Aeronautics and Space Administration
Kennedy Space Center, Florida

October 1968

GP 381
September 30, 1968

FOREWORD

With the publication of this edition, "A Summary of Major NASA Launchings, Eastern Test Range and Western Test Range" now spans the first ten years in the launch history of the National Aeronautics and Space Administration, from October 1, 1958 through September 30, 1968. The initial brief summary of NASA Atlantic Missile Range (AMR) launchings was prepared as a reference tool for internal use within the Launch Operations Center Historical Branch. Repeated requests for information concerning NASA launch activities warranted the presentation of this information in handy form for broader distribution. In order to ensure its continued value as a reference tool, the Summary was periodically revised and now includes major NASA launchings conducted under the direction of John F. Kennedy Space Center (or its antecedents) from both the Eastern and Western Test Ranges. An Appendix has been added, covering space launchings that occurred prior to October 1, 1958. This edition supersedes all previous issues of this publication.

The material contained in this report was compiled from several different sources. Mission-oriented documents consulted included: Operations Summaries, post-launch Flash Flight Reports, Final Field Reports, Mission Operations Reports (both pre-launch and post-launch), and Satellite Situation Reports. Other major references were publications of the NASA Historical Office, such as: Aeronautics and Astronautics 1915-1960; Aeronautical and Astronautical Events of 1961-1962; Aeronautics and Astronautics (yearly editions since 1963); and NASA's Pocket Statistics (published monthly). The TRW Space Log and other similar commercial media were also reviewed. The writer is indebted to Francis E. Jarrett, Jr., KSC Historian, and William V. Schenck, formerly of the KSC historical staff, for their work in preparing earlier summaries.

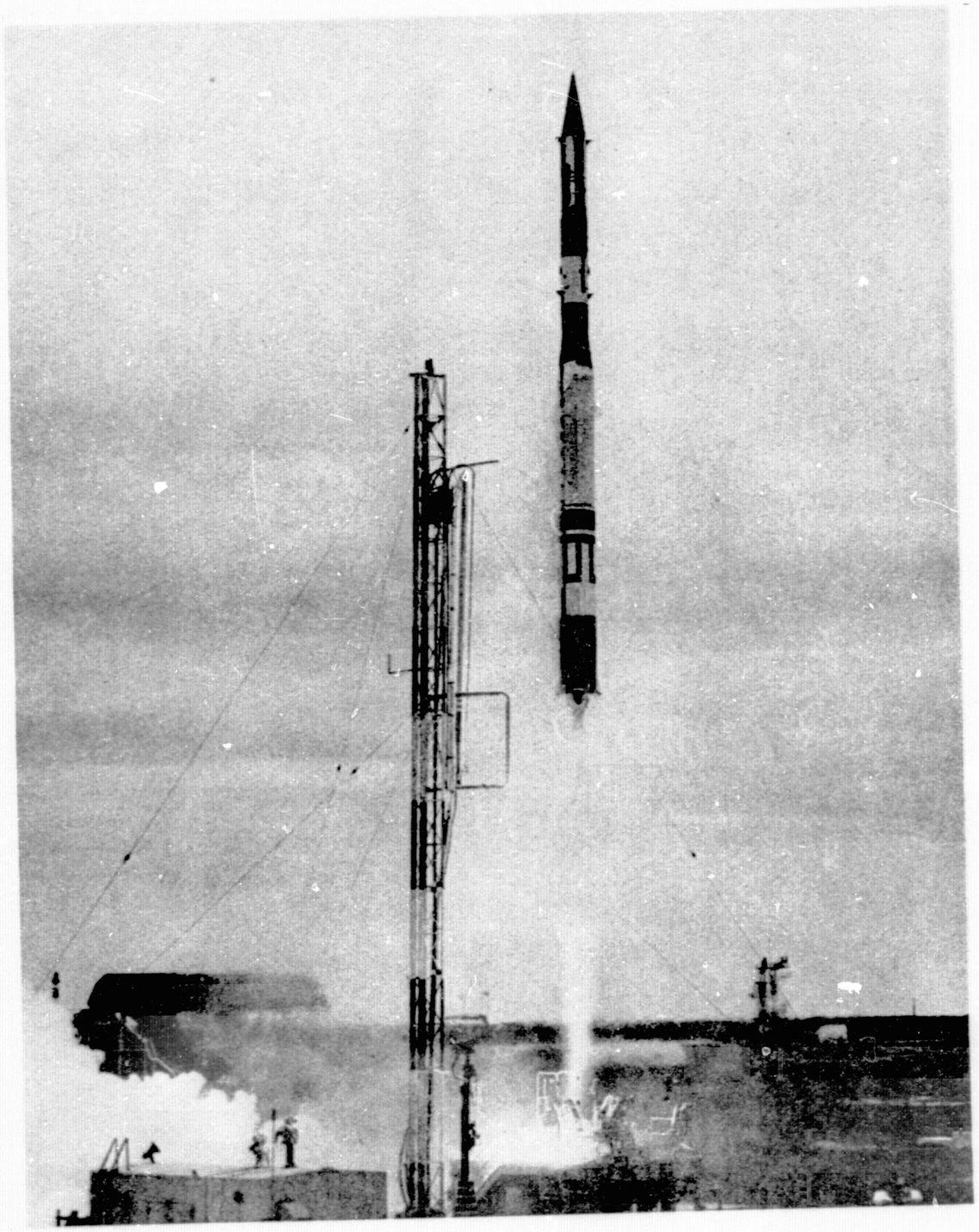
The report is broken down into projects within broad mission categories, with each project being treated chronologically. Each mission has been labeled with the classification S (Successful) or U (Unsuccessful). In a successful mission, the primary mission objectives were accomplished. Unsuccessful indicates that the objectives of the mission were not obtained, although even those launches may have provided some collateral information. These are arbitrary classifications, made after a comparison of objectives and actual results.

The information presented on ETR launches, with the exception of the "Remarks" column, has also been prepared in chart form and is available from the KSC Historical and Library Services Branch. Comments, criticisms, and suggestions for the improvement of content, format and usefulness of this publication are solicited. Correspondence should be addressed to: Historical and Library Services Branch (IS-CAS-4), John F. Kennedy Space Center, NASA, Kennedy Space Center, Florida 32899.

William A. Lockyer, Jr.

TABLE OF CONTENTS

TABLE OF CONTENTS
(continued)



VANGUARD SLV-4 17 FEBRUARY 1959 VANGUARD II

KSC HISTORICAL REPORT

SUMMARY OF MAJOR NASA ETR AND WTR LAUNCHINGS, 1 OCTOBER 1958 - 30 SEPTEMBER 1967

GEOPHYSICS AND ASTRONOMY PROGRAMS

Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
BEACON					
Beacon	22 Oct 58	Juno I (Jupiter C)	--	ETR 5	Atmospheric Physics. Attempt to place a 92.6 pounds 12-foot diameter inflatable sphere of micro-thin plastic, covered with aluminum foil, into a high altitude orbit failed; premature upper-stage separation. Payload flight time, 424 seconds. (U)
Beacon	14 Aug 59	Juno II	--	ETR 26B	Atmospheric Physics. Attempt to orbit 12-foot diameter, high visibility, aluminum sphere failed due to premature fuel depletion in booster, with ensuing main engine cutoff, and unrelated upper-stage malfunction in attitude control system. (U)
VANGUARD					
Vanguard II	17 Feb 59	Vanguard SLV-4	1959 Alpha I (Satellite) 1959 Alpha II (Casing)	ETR 18A	Meteorology. First fully instrumented Vanguard payload in orbit; excessive wobble of sphere was caused by third stage bumping into satellite; cloud cover data not used. Transmitted for 18 days, still in orbit. (P)

GEOPHYSICS ANL ASTRONOMY PROGRAMS
(continued)

Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
Vanguard	13 Apr 59	Vanguard SLV-5	--	ETR 18A	Second-stage failure; tumbling resulted from thrust chamber damage. (U)
Vanguard	22 Jun 59	Vanguard SLV-6	--	ETR 18A	Second-stage failure; helium tank burst as a result of faulty pressure regulator in propulsion system. (U)
Vanguard III	18 Sep 59	Vanguard SLV-7	1959 Eta	ETR 18A	Magnetic field, radiation belt, and micro-meteoroid findings. Transmissions ceased December 11, 1959. Still in orbit. (S)
EXPLORER					
Explorer	16 Jul 59	Juno II	S-1	ETR 5	Attempt to place a 91.5 lb. satellite into orbit. Complete loss of power to guidance and control system at liftoff caused missile to deviate from intended flight path. Destroyed by range safety officer 5½ seconds after launch. (U)
Explorer VI	7 Aug 59	Thor-Able	S-2	ETR 17A	Injected into most eccentric orbit achieved by any satellite up to that time; measured Van Allen belt and cosmic radiation, mapped the earth's magnetic field, and provided a crude TV image of the earth's cloud cover. Significant discovery of large electrical current system in the outer atmosphere. Transmitted data until October 6, 1959. Re-entered in July 1961. (S)

GEOPHYSICS AND ASTRONOMY PROGRAMS
(continued)

Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
Explorer VII	13 Oct 59	Juno II	S-1a	ETR 5	91.5 lb. satellite successfully injected into orbit around the earth; provided significant data on trapped radiation and cosmic radiation near the earth. Seventh and last U.S. IGY earth satellite. Transmitted data until late 1961; still in orbit. (S)
Explorer	23 Mar 60	Juno II	S-46	ETR 26B	Attempt to orbit satellite equipped to analyze radiation energies in the Van Allen radiation zones; orbit velocity not achieved due to failure of upper-stages to ignite. Communication with launch vehicle was lost after second-stage burnout. (U)
Explorer VIII	3 Nov 60	Juno II	S-30	ETR 26B	All systems functioned normally to put into an elliptical orbit a scientific earth satellite carrying instrumentation for detailed measurements of the ionosphere. Transmitted data until December 27, 1960; still in orbit. (S)
Explorer	24 Feb 61	Juno II	S-45	ETR 26B	Primary mission of injecting into orbit an ionosphere satellite was not achieved. Series of irregularities occurred following first stage separation, preventing firing of upper stages. (U)


UNITED STATES

GEOPHYSICS AND ASTRONOMY PROGRAMS
(continued)

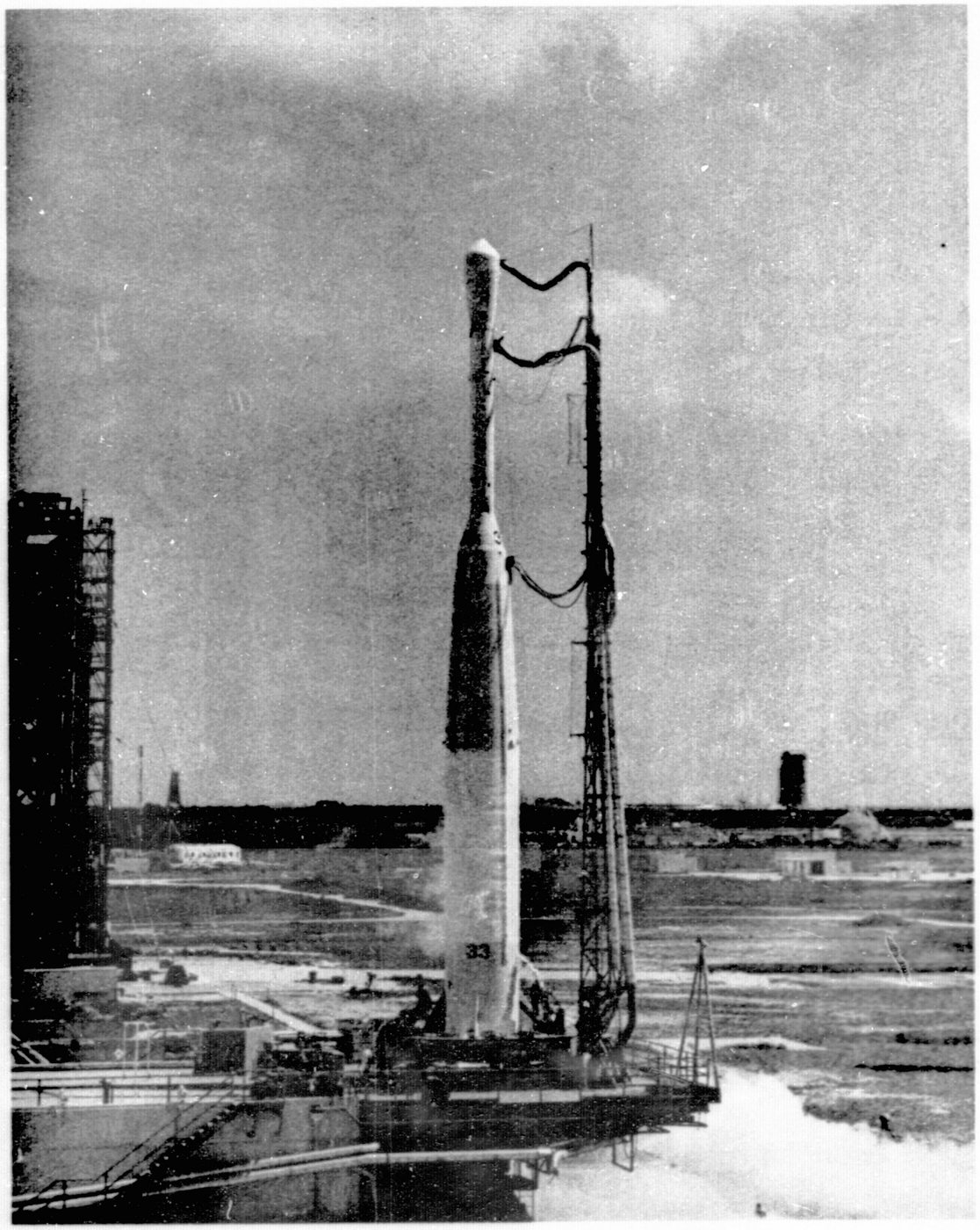
Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
Explorer X	25 Mar 61	Delta	P-14	ETR 17A	Satellite probe, highly eccentric orbit. Transmitted data on earth and interplanetary magnetic fields and solar wind. Present position uncertain. (S)
Explorer XI	27 Apr 61	Juno II	S-15	ETR 26B	Placed astronomy telescope satellite into orbit to detect high energy gamma rays from cosmic sources and to map their special distribution. Vehicle and all payload systems functioned as planned. Still in orbit. (S)
Explorer	24 May 61	Juno II	S-45a	ETR 26B	Primary mission of injecting artificial earth satellite into orbit was not achieved. Second stage was not brought to ignition because of apparent voltage drop. Satellite was to study ionosphere measurements. (U)
Explorer XII	15 Aug 61	Delta	S-3	ETR 17A	Data on magnetic fields, energetic particles, and solar wind. Data received from all experiments; transmitted until December 6, 1961; re-entered in September 1963. (S)
Explorer XIV	2 Oct 62	Delta	S-3a	ETR 17B	Highly elliptical orbit. Energetic particles experiment. Still in orbit, but orbital elements no longer maintained. Data transmission continued until August 10, 1963. (S)

GEOPHYSICS AND ASTRONOMY PROGRAMS
(continued)

Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
Explorer XV	27 Oct 52	Delta	S-3b	ETR 17B	A 98 pound satellite to study artificial radiation belt. High spin rate, still in orbit, but orbital elements no longer maintained. (S)
Explorer XVII	2 Apr 63	Delta	S-6	ETR 17A	Satellite studied density, pressure, composition, and temperature of the earth's upper atmosphere. Re-entered on November 24, 1966. (S)
Explorer XVIII	26 Nov 63	Delta	IMP-A (S-74)	ETR 17B	Successful launching an an Interplanetary Monitoring Probe; its mission was to measure the major magnetic field phenomena in space, including the interplanetary magnetic field, interactions of the streaming solar plasma, and the geomagnetic field, galactic and solar radiation. Re-entered in November 1965. (S)
Beacon-Explorer A	19 Mar 64	Delta	BE-A (S-66)	ETR 17A	Purpose of mission was to study the ionosphere. Contact lost with satellite 22 seconds after third stage ignition of the Delta booster. Beacon-Explorer was to have reflected back to earth laser rays fired at it from Wallops Island, Va. The Delta failure was the first in 23 consecutive firings for the space agency. (U)
Explorer XXI	3 Oct 64	Delta	IMP-B	ETR 17A	Detailed study of environment of cislunar space through cosmic ray, solar wind and magnetic field measurements. The spacecraft did not achieve an orbit in true interplanetary space as planned, but operated satisfactorily. Re-entered in January 1966. (S)

GEOPHYSICS AND ASTRONOMY PROGRAMS
(continued)

Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
Explorer XXVI	21 Dec 64	Delta	EPE-D	ETR 17A	Particles and fields; study of injection, trapping, and loss mechanisms of trapped radiation belts, both natural and artificial. The fourth satellite in the Energetic Particles Explorer series. Still transmitting. Still in orbit, but orbital elements no longer maintained. (S)
Explorer XXVIII	29 May 65	Delta	IMP-C	ETR 17B	Particles and Fields; measured magnetic fields, cosmic rays and solar wind from near earth to deep space distances. Third in the IMP series. Orbit somewhat higher than planned. Still in orbit, but orbital elements not maintained. (S)
Explorer XXXI	28 Nov 65	Thor-Agena B	DME-A	WTR SLC-2E	Dual launch with Alouette II. Complemented Alouette by taking measurements of ionospheric characteristics with a companion spacecraft. Still in orbit; still transmitting. (S)
Explorer XXXII	25 May 66	Delta	AE-B	ETR 17B	Atmosphere explorer; the payload is designed to collect temperature, composition, density, and pressure data to permit the study of the physics of the atmosphere on a global basis. Still in orbit. (S)

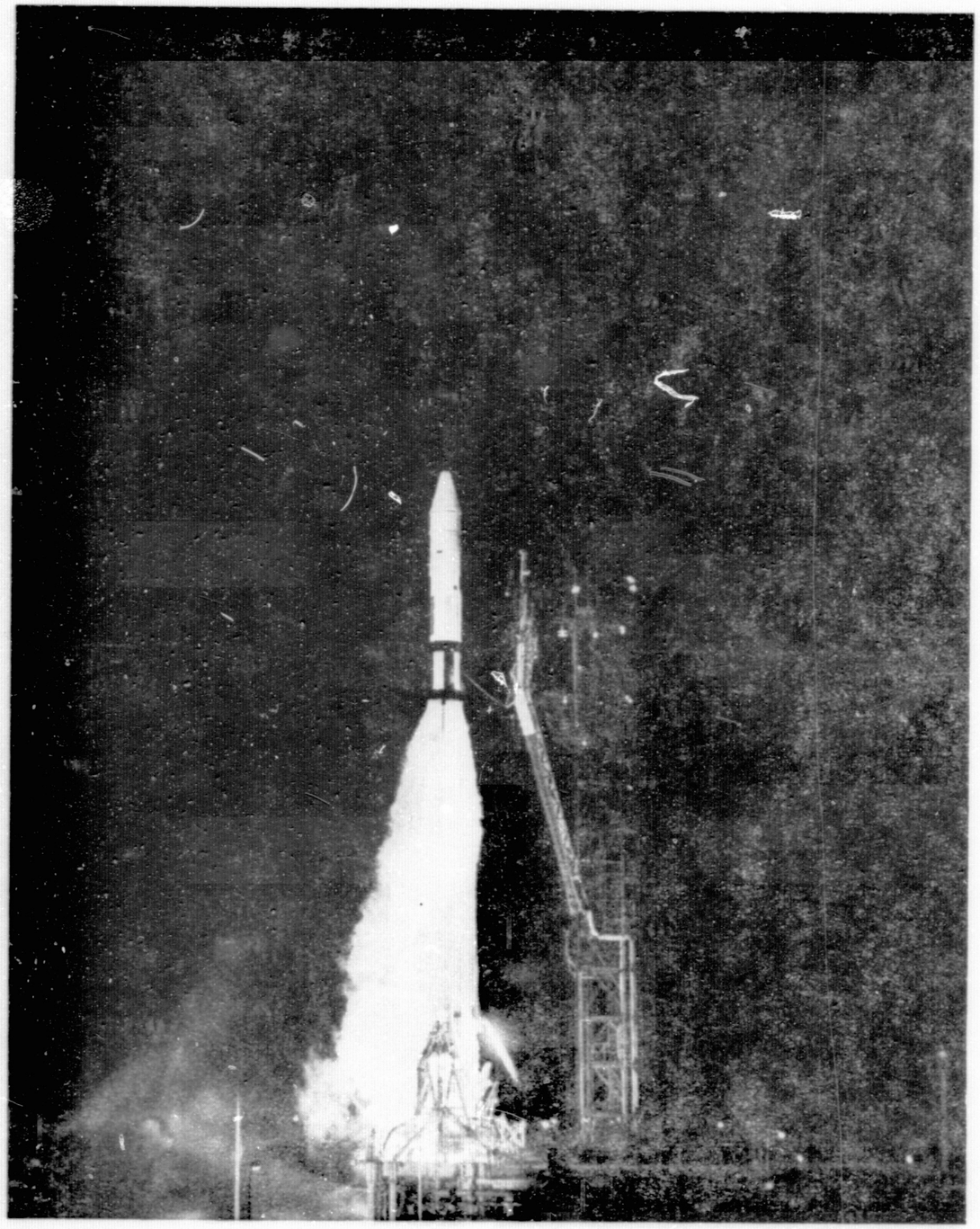


Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
Explorer XXXIII	1 Jul 66	TAD (Thrust Augmented Delta)	IMP-D	ETR 17A	Anchored Interplanetary Monitoring Platform (AIMP), designed to become the nation's first moon satellite. However, the second stage of the Delta booster accelerated too rapidly for the retro-rocket compensation necessary to achieve lunar orbit. The spacecraft is now in a looping earth orbit (18,930-278,523) sending back information on radiation, magnetic fields, and solar winds. (S)
Explorer XXXIV	24 May 67	TAD	IMP-F	WTR SLC-2E	Interplanetary Monitoring Platform (IMP), satellite to study solar and galactic cosmic radiation, solar plasma, and related phenomena. Highly elliptical polar orbit. All eleven experiments functioned. Still in orbit; still transmitting. (S)
Explorer XXXV	19 Jul 67	Delta	IMP-E	ETR 17B	Explorer XXXV was the 50th Delta launch for NASA, of which only three have failed, a 94% success. The 235 lb. satellite, an Interplanetary Monitoring Platform, studies interplanetary space phenomena with emphasis on study of solar wind and magnetic field at lunar distances. Explorer XXXV is in a selenocentric (moon-centered) orbit, and still transmitting. (S)

GEOPHYSICS AND ASTRONOMY PROGRAMS
(continued)

Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
Explorer XXXVIII	4 Jul 68	Delta	RAE-A	WTR SLC-2E	Liftoff at 0825 PDT was normal, and performance of all three launch vehicle stages was nominal. 420 lb. spacecraft, a Radio Astronomy Explorer, was injected into an elliptical orbit with an apogee of 3647 statute miles and a perigee of 389 miles. Mission intended to investigate sporadic radio bursts from Jupiter, Earth, and the Sun; radio emission from discrete cosmic sources; plasma oscillations and background radio emission from galactic sources. (S)
GEODETIC EARTH ORBITING SATELLITES (GEOS)					
Explorer XXIX (GEOS I)	6 Nov 65	TAD	GEOS-A	ETR 17A	First launch of an improved thrust-augmented Delta; first gravity-gradient stabilized satellite launched by NASA. Purpose was to investigate earth's gravitational field, to improve world-wide geodetic accuracies, and to improve positional accuracies of satellite tracking sites. Still in orbit. (S)
PAGEOS I	23 Jun 67	TAT-Agena	Pageos A	WTR SLC-2E	Passive Geodetic Earth Orbiting Satellite. Near circular polar orbit. Similar to Echo I, aluminum covered mylar balloon, 100-foot diameter. No instruments, world-wide triangulation network by optical sightings allows very accurate mapping. Still in orbit. (S)

Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
Explorer XXXVI (GEOS II)	11 Jan 68	Delta	GEOS-B	WTR SLC-2E	Second spacecraft of the GEOS series and fifth satellite to be launched in the National Geodetic Satellite Program (NGSP). Successfully launched at 1116 EST and injected into an orbit very close to that planned. Following verification of orbital parameters, spacecraft was checked out, and was declared operational on February 20, 1968. GEOS II will extend the investigations associated with the NGSP. (S)
ORBITING SOLAR OBSERVATORY (OSO)					
OSO I	7 Mar 62	Delta	S-16	ETR 17A	Measured solar flares and subflares; transmitted data on sun's radiation in ultraviolet, X-ray, and gamma ray regions, plus other solar phenomena. Prior to OSO I, less than an hour of solar phenomena data had been collected from above the earth's atmosphere. Still in orbit. (S)
OSO II	3 Feb 65	Delta	OSO-B2	ETR 17B	Solar physics; continuation of OSO I studies with added ability to scan the solar disc and part of the corona. Still in orbit. (S)
OSO-C	25 Aug 65	Delta	OSO-C	ETR 17B	Solar physics, spacecraft was similar to OSO I and OSO II. Failed to orbit due to premature ignition of the third stage. (U)



Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
OSO III	8 Mar 67	Delta	OSO-E-I	ETR 17A	Identical to the unsuccessful OSO C. Nine separate experiments to provide data on solar disturbances and radiation in space. In earth orbit; still transmitting. (S)
OSO IV	18 Oct 67	Delta	OSO-D	ETR 17B	Solar Physics. Launched at 11:58 AM EDT into extremely good circular orbit with apogee of 354.18 statute miles and perigee of 353.68 statute miles. (Desired apogee and perigee were 345 statute miles.) All spacecraft systems operated nominally following injection into orbit. Experiments conducted by Harvard College Observatory, American Science and Engineering, University College, London, Naval Research Laboratory, and Lawrence Radiation Laboratory. Still in orbit; still transmitting. (S)
ORBITING GEOPHYSICAL OBSERVATORY (OGO)					
OGO I	4 Sep 64	Atlas-Agena	OGO-A	ETR 12	First orbiting geophysical observatory, designed to conduct numerous space experiments simultaneously. OGO-A carried 20 tests. Failure to lock into earth orbit resulted in solar panels generating insufficient power to complete all experiments. Considered successful since 75% of planned data acquisition was obtained. Still in orbit; still transmitting. (S)

GEOPHYSICS AND ASTRONOMY PROGRAMS
(continued)

Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
OGO II	14 Oct 65	TAT-Agena	OGO-C	WTR SLC-2E	Launched into a low altitude, nearly polar orbit to allow observation of near earth phenomena. Atmospheric and earth magnetic survey, 19 of 20 experiments worked. Horizon scanners drifted, causing depletion of stabilization gas supply, which caused loss of electrical power. Ceased transmitting on October 24, 1965. Still in orbit. (U)
OGO III	6 Jun 66	Atlas-Agena	OGO-B	ETR 12	Interdisciplinary studies. Earth-sun space interrelationships using a highly elliptical orbit to correlate studies of particles and fields, atmospheric physics, solar, and other emissions. Development and operation of a standardized, observatory type oriented spacecraft. Demonstrated capability of a three-axis stabilized observatory. Still in orbit; still transmitting. (S)
OGO IV	28 Jul 67	TAT-Agena		WTR SLC-2E	Satellite put into nearly polar orbit. Mission is to study the effects of solar activity on the earth's environment during a period of increased solar activity. Still in orbit; still transmitting. (S)

Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
OGO V	4 Mar 68	Atlas-Agena	OGO-E	ETR 13	Fifth of six approved missions in the OGO program. Successfully launched at 0806 EST into a parking orbit. After a 32 minute coast period, Agena stage was restarted, injecting spacecraft into a highly elliptical equatorial orbit with an apogee of 92,074 statute miles and a perigee of 168 miles. This orbit permits the spacecraft to pass in and out of Earth's magnetosphere, sweeping the forward leading quadrant and the geomagnetic tail, as it acquires data on magnetic fields, energetic particles, and plasma. Last NASA launch using Atlas-Agena vehicle. Last NASA launch from Launch Complex 13, Cape Kennedy. Still in orbit; still transmitting. (S)
ORBITING ASTRONOMICAL OBSERVATORY (OAO)					
OAO I	8 Apr 66	Atlas-Agena	OAO-AI	ETR 12	Orbiting Astronomical Observatory. Capable of accurate, long duration pointing for ultraviolet, X-ray, and gamma ray observations and mapping anywhere in the celestial sphere. Spacecraft was lost after two days due to spacecraft systems anomalies. However, it is still in orbit. (U)

Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
APPLICATIONS TECHNOLOGY SATELLITES (ATS)					
ATS-I	6 Dec 66	Atlas-Agena	ATS-B	ETR 12	First satellite in Applications Technology Satellite Program. The 775 lb. satellite was placed in circular, equatorial synchronous orbit. Used for 15 separate experiments related to communication and meteorology and control technology. Four more such satellites are planned. Still in orbit; still transmitting. (S)
ATS-II	5 Apr 67	Atlas-Agena	ATS-A	ETR 12	Purpose of satellite was to evaluate gravity-gradient system for spacecraft stabilization. Entered elliptical transfer orbit, but failed to go into circular orbit when 2nd stage Agena engine failed to re-ignite. Still in orbit; still transmitting. Some experiments were carried out, but NASA ruled the satellite unsuccessful. (U)

GEOPHYSICS AND ASTRONOMY PROGRAMS
(continued)

Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
ATS-III	5 Nov 67	Atlas-Agena	ATS-C	ETR 12	Third in current series of five Applications Technology Satellites. Contained 14 applications technology experiments concerned with communications, meteorology, stabilization and pointing technology, orbital technology, and space environmental degradation. Launch vehicle injected spacecraft into highly elliptical orbit. Then, at apogee of second orbit, apogee kick motor was fired on ground command to transfer spacecraft into near-stationary equatorial orbit at approximately 22,200 statute miles and about 47 degrees West longitude. Transmitted excellent quality high-resolution photos of entire visible disk of Earth. Still in orbit; still transmitting. (S)
ATS-IV	10 Aug 68	Atlas-Centaur	ATS-D	ETR 36	Liftoff at 6:33 PM EDT was normal and within the desired launch window. The Centaur first burn injected the Centaur and ATS-D into a parking orbit. However, the Centaur second ignition did not occur, and attempts to separate the ATS-D from the Centaur were unsuccessful. Although the mission was a failure, the satellite is in orbit and was therefore designated ATS-IV. (U)

Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
BIOSATELLITES (BIOS)					
BIOS I	14 Dec 66	Delta	BIOS-A	ETR 17A	Objective of satellite was to test the effect of weightlessness and space radiation on growth of plants and animals. Satellite contained millions of animal and plant cells. Satellite worked well, but retrorocket failed to fire, leaving capsule in orbit instead of parachuting it into the recovery area. No useful data was acquired. Satellite and capsule re-entered February 15, landing near Australia, but was not recovered. Search called off on February 22, 1966. (P)
BIOS II	7 Sep 67	TAD	BIOS-B	ETR 17B	Objectives were similar to those of BIOS-A. Satellite worked well, except for slight difficulty in accepting ground commands. Because of concern with the command reception and weather in the recovery area, it was decided to de-orbit on orbit 30, rather than continue 3-day mission. All de-orbit events occurred normally, and capsule was recovered by aircraft over the Pacific within 15 miles of predicted impact point on September 9, 1967. Remainder of satellite re-entered atmosphere on October 4, 1967. (S)

GEOPHYSICS AND ASTRONOMY PROGRAMS
(continued)

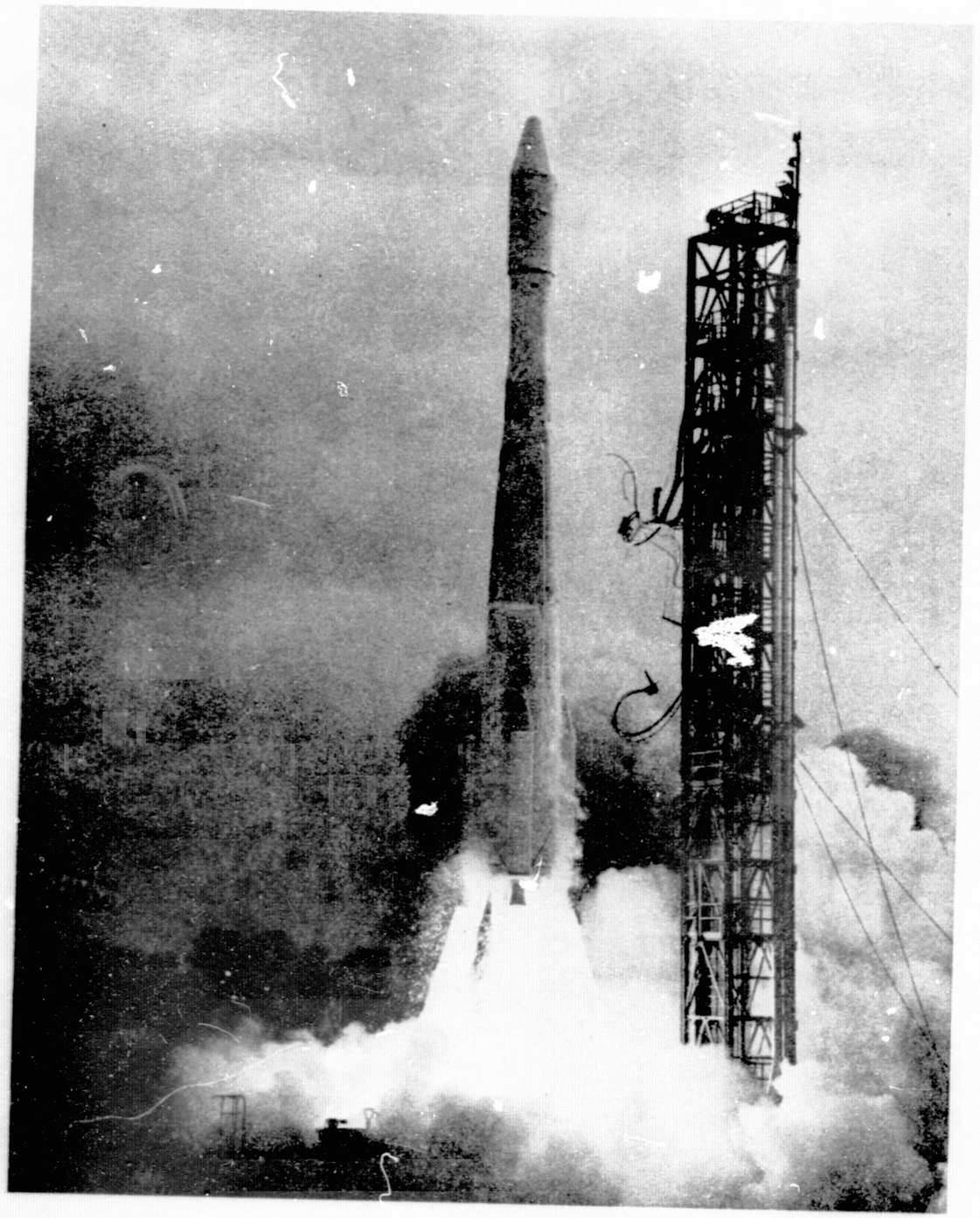
Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
JOINT PROGRAMS					
Ariel I	26 Apr 62	Delta	S-51 (UK-1)	ETR 17A	First international satellite, joint U.S.-U.K. venture. Performed ionospheric and solar radiation studies. Still in orbit; transmitted until November 1964. (S)
Alouette I	29 Sep 62	Thor-Agena	S-27	WTR SLC-2E	First NASA launch from WTR, first use by NASA of the Thor-Agena. Canadian built satellite, put into polar orbit of 597-619 miles. Investigated upper levels of ionosphere and aspects of space noise, and measured electron density. Experiments revealed that effective radio frequency reflecting surfaces in the polar regions were very rough, and that temperatures 300 miles above the earth varied greatly and increased with latitude. Still in orbit; still transmitting. (S)
Alouette II	28 Nov 65	Thor-Agena	Alouette B	WTR SLC-2E	Dual launch with Explorer XXXI. Initiated a NASA-Canadian International Satellites for Ionospheric (ISIS) program. Satellites were placed in near duplicate orbits of 310-1850 miles. Eight experiments of Explorer XXXI were correlated with five of Alouette II. Extended to polar regions ionospheric soundings begun by Alouette I. Still in orbit; still transmitting. (S)

METEOROLOGICAL EARTH SATELLITES

Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
TEST INFRA-RED OBSERVATION SATELLITES (TIROS)					
Tiros I	1 Apr 60	Thor-Able	A-1	ETR 17A	First true meteorological satellite; photographed cloud cover. Demonstrated that satellites can be used to survey other surface features from space. Still in orbit. (S)
Tiros II	23 Nov 60	Delta	A-2	ETR 17A	Combined infrared measurements with photography. Wide-angle photos were substandard. Transmitted data until December 4, 1960; still in orbit. (S)
Tiros III	12 Jul 61	Delta	A-3	ETR 17A	Launched during hurricane season; one camera system failed by the end of July, the other was used until February 1962. Weather Bureau reported Tiros III spotted 50 tropical storms during the summer of 1961. Still in orbit. (S)
Tiros IV	8 Feb 62	Delta	A-9	ETR 17A	All systems provided good data. Clarity of pictures from the new wide-angle lens was outstanding. Photos unclear after June 14, 1962. Still in orbit. (S)
Tiros V	19 Jun 62	Delta	A-50	ETR 17A	Orbit more elliptical than planned. First to spot five of the ten major tropical storms around the world in August. Still in orbit. (S)

METEOROLOGICAL EARTH SATELLITES
(continued)

Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
Tiros VI	18 Sep 62	Delta	A-51	ETR 17A	Launch moved up from November to cover storm season. Performed as planned. One camera failed December 1, 1962. Still in orbit. (S)
Tiros VII	19 Jun 63	Delta	A-52	ETR 17B	First Tiros to carry an electron temperature and density probe. Still in orbit. (S)
Tiros VIII	21 Dec 63	Delta	A-53 Tiros H	ETR 17B	Eight successful Tiros launch; its primary mission was to test a new experimental camera subsystem, called Automatic Picture Transmission (APT); also carried a TV camera similar to the one carried on previous Tiros satellites. Still in orbit. (S)
Tiros IX	22 Jan 65	Delta	Tiros I	ETR 17A	First Tiros cartwheel configuration for increased coverage of world cloud cover; elliptical polar orbit. Still in orbit. (S)
Tiros X	1 Jul 65	Delta	OT-I	ETR 17B	First Weather Bureau funded spacecraft; spin-stabilized configuration with two 104° TV cameras, similar to Tiros VI. Placed in near perfect sun synchronous orbit to obtain photo data on storm breeding areas of hurricanes and typhoons. Still in orbit. (S)



DELTA 28 FEBRUARY 1966 ESSA II

METEOROLOGICAL EARTH SATELLITES
(continued)

Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
ENVIRONMENTAL SURVEY SATELLITES (ESSA)					
ESSA I	3 Feb 66	Delta	OT-3 (TOS)	ETR 17A	Provided cloud coverage of the entire sunlit portion of the earth at least once a day for operational use. First of the Tiros Operational Satellite (TOS) series. Eleventh straight success for TIROS. Funded by Environmental Science Administration. Still in orbit. (S)
ESSA II	28 Feb 66	Delta	OT-2 (TOS)	ETR 17B	Advanced version of cartwheel configuration. Permits local readout of daylight cloud cover by Automatic Picture Transmission (APT) TV system. Polar, sun synchronous orbit; still transmitting. (S)
ESSA III	2 Oct 66	TAD	TOS-A	WTR SLC-2E	Launched to replace ESSA I. Near polar, sun synchronous orbit. Provided daily global photographic coverage. Advanced cartwheel design. Replaced by ESSA V, but still in orbit; still transmitting. (S)
ESSA IV	26 Jan 67	TAD	TOS-B	WTR SLC-2E	Polar orbit, sun synchronous. Advanced cartwheel type. Two Automatic Picture Transmission camera systems, one inoperable because of shutter problems. Replaced ESSA II whose usefulness was limited by orbital drift. Still in orbit. (S)

METEOROLOGICAL EARTH SATELLITES
(continued)

Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
ESSA V	20 Apr 67	TAD	TOS-C	WTR SLC-2E	Polar orbit, sun synchronous. Carried two Advanced Vidicon Camera Systems to provide 24 hour global weather coverage. Turned over to ESSA May 8. Still in orbit; still transmitting. (S)
ESSA VI	10 Nov 67	TAD	TOS-D	WTR SLC-2E	Operational cloud mapping spacecraft launched into an Earth-oriented, near-polar orbit to provide real-time data for weather analysis and forecasting. Launch vehicle successfully injected spacecraft into desired orbit at an inclination to the equator of 102°, with an apogee of 925 and a perigee of 876 statute miles. Orbital period is 114.8 minutes. All spacecraft subsystems performed well. Still in orbit; still transmitting. (S)
ESSA VII	16 Aug 68	Delta	TOS-E	WTR SLC-2E	Seventh spacecraft in the TIROS Operational Satellite (TOS) series and seventeenth in the TIROS series. ESSA VII was successfully launched into the desired orbit at 7:24 AM EDT. The 340 pound polyhedral spacecraft carries two advanced Vidicon Camera Systems (AVCS) to obtain daily global cloud photos and a flat plate radiometer to measure the heat balance of the atmosphere. Following operational checkout of the spacecraft's systems by NASA, it was turned over to ESSA for operational use in the National Meteorological Satellite System. (S)

METEOROLOGICAL EARTH SATELLITES
(continued)

Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
NIMBUS					
Nimbus I	28 Aug 64	Thor-Agena	Nimbus A	WTR SLC-2E	Polar orbit. 3½ week life because of mechanical problem causing loss of battery power. Orbit more elliptical than planned due to premature Agena cutoff, thus pictures of earth were not overlapping. Used APT to send cloud cover pictures to local stations. Also, took cloud cover pictures of dark side of earth through infrared camera. Produced over 27,000 pictures. Still in orbit. (S)
Nimbus II	15 May 66	TAT-Agena	Nimbus B	WTR SLC-2E	600 mile near circular orbit. Used to provide global weather photography and infrared data on study of earth's heat balance. APT with direct local readout. Infrared radiometer provided night cloud cover photos. Still in orbit; still transmitting. (S)

METEOROLOGICAL EARTH SATELLITES
(continued)

Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
Nimbus	18 May 68	Thorad-Agena (Thrust Augmented Thor-Agena)	Nimbus B	WTR SLC-2E	First NASA launch using Thorad-Agena. Spacecraft included a radioisotope thermoelectric generator (SNAP-19), augmenting the solar conversion power supply, to assess operational capability of radioisotope power for long life weather satellites. Also carried as a "piggy-back" payload was a U.S. Army SECOR (Sequential Collation of Range) geodetic satellite. Liftoff at 0123 PDT was normal. However, although the solid-propellant strap-on boosters performed normally, the Thor engine began an undamped oscillation about two seconds after liftoff. The launch vehicle was destroyed by the Range Safety Officer after 121 seconds of flight when it veered beyond limits. (U)

COMMUNICATIONS AND NAVIGATION PROGRAM

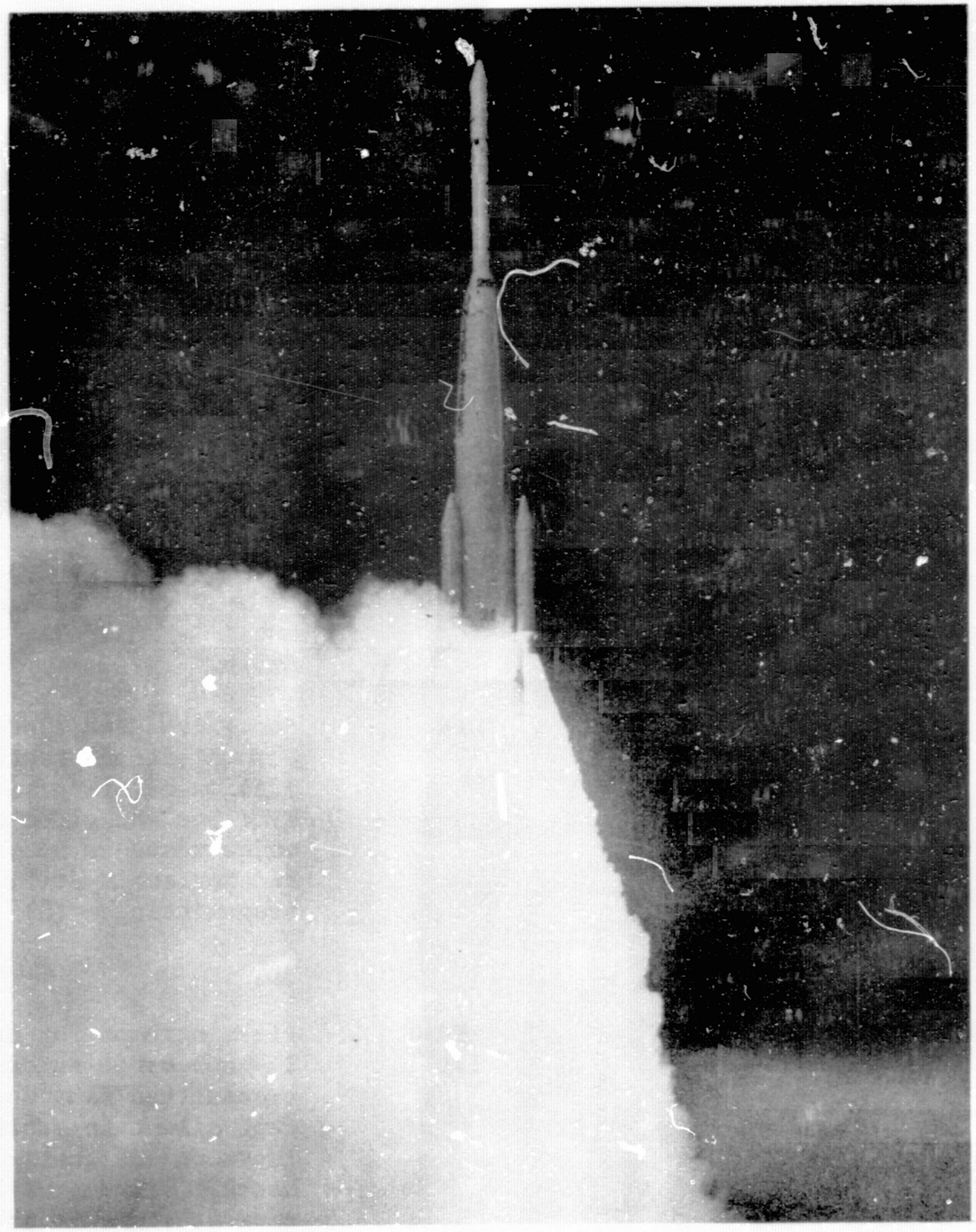
Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
ECHO					
Echo	13 May 60	Delta	A-10	ETR 17A	Attempt to launch a 100 foot passive reflector sphere into orbit failed due to failure in upper stages. (U)
Echo I	12 Aug 60	Delta	A-11	ETR 17A	First passive communications satellite; 100 foot diameter sphere used as a reflecting relay for global communications was largest and most visible satellite to that time. Numerous successful long range transmissions. Lost its spherical shape due to meteorite punctures and loss of internal gases. Re-entered atmosphere May 24, 1968. (S)
Echo (Test)	15 Jan 62	Thor	AVT-1	ETR 17A	"Big Shot" suborbital inflation test of 135 foot diameter sphere. Canister ejection successful, but too rapid inflation ripped balloon apart at 250 mile altitude. Capsule with movie film re-entered and was recovered. (U)
Echo (Test)	18 Jul 62	Thor	AVT-2	ETR 17A	Inflation test of 13 story balloon, "Big Shot", was successful. Visible for 10 minutes from Cape Canaveral, it was the largest man-made object sent into space, the previous record being held by Echo I. Re-entered July 27, 1962. (S)

COMMUNICATIONS AND NAVIGATION PROGRAM
(continued)

Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
Echo II	25 Jan 64	Thor-Agena	A-12	WTR SLC-2E	Passive communications satellite. 535 lb. balloon, 135 ft. diameter. International communications experiments between U.K. and U.S.S.R. and U.S. Still in orbit. (S)
RELAY					
Relay I	13 Dec 62	Delta	A-15	ETR 17A	First launch with uprated Delta. Power supply voltage originally too low for communication experiments; voltage built up and early in January 1963 transatlantic TV transmissions began. Still in orbit. (S)
Relay II	21 Jan 64	Delta	A-16	ETR 17B	Similar to Relay I, but had longer expected operating time, more efficient orbit and internal changes designed to improve operation over earlier design. The 183.6 lb. spacecraft successfully transmitted television test patterns at the end of its first orbit and performed successfully when tested on subsequent orbits. Still in orbit; still transmitting. (S)

COMMUNICATIONS AND NAVIGATION PROGRAM
(continued)

Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
TELSTAR					
Telstar I	10 Jul 62	Delta	A-40	ETR 17B	First active communication satellite (also first commercial satellite), owned and operated by AT&T, launched by NASA. Transmission ceased on November 23, 1962 but was restored on January 4, 1963 and transmitted until February 21, 1963. Still in orbit. (S)
Telstar II	7 May 63	Delta	A-41	ETR 17B	Satellite used successfully for several communications tests, including transmission of black and white and color TV (live and video tape) as well as voice messages between U.S., France, and England. Still in orbit; not transmitting. (S)
SYNCOM					
Syncom I	14 Feb 63	Delta	A-25	ETR 17B	First attempt for near-synchronous, 24-hour orbit successful. Satellite transmitted data during launch, then went silent in orbit. Was lost until location was confirmed by photographs March 1, 1963. Still in orbit, but current elements not maintained. (P)



THRUST-AUGMENTED DELTA 19 AUGUST 1964 SYNCOM III

COMMUNICATIONS AND NAVIGATION PROGRAM
(continued)

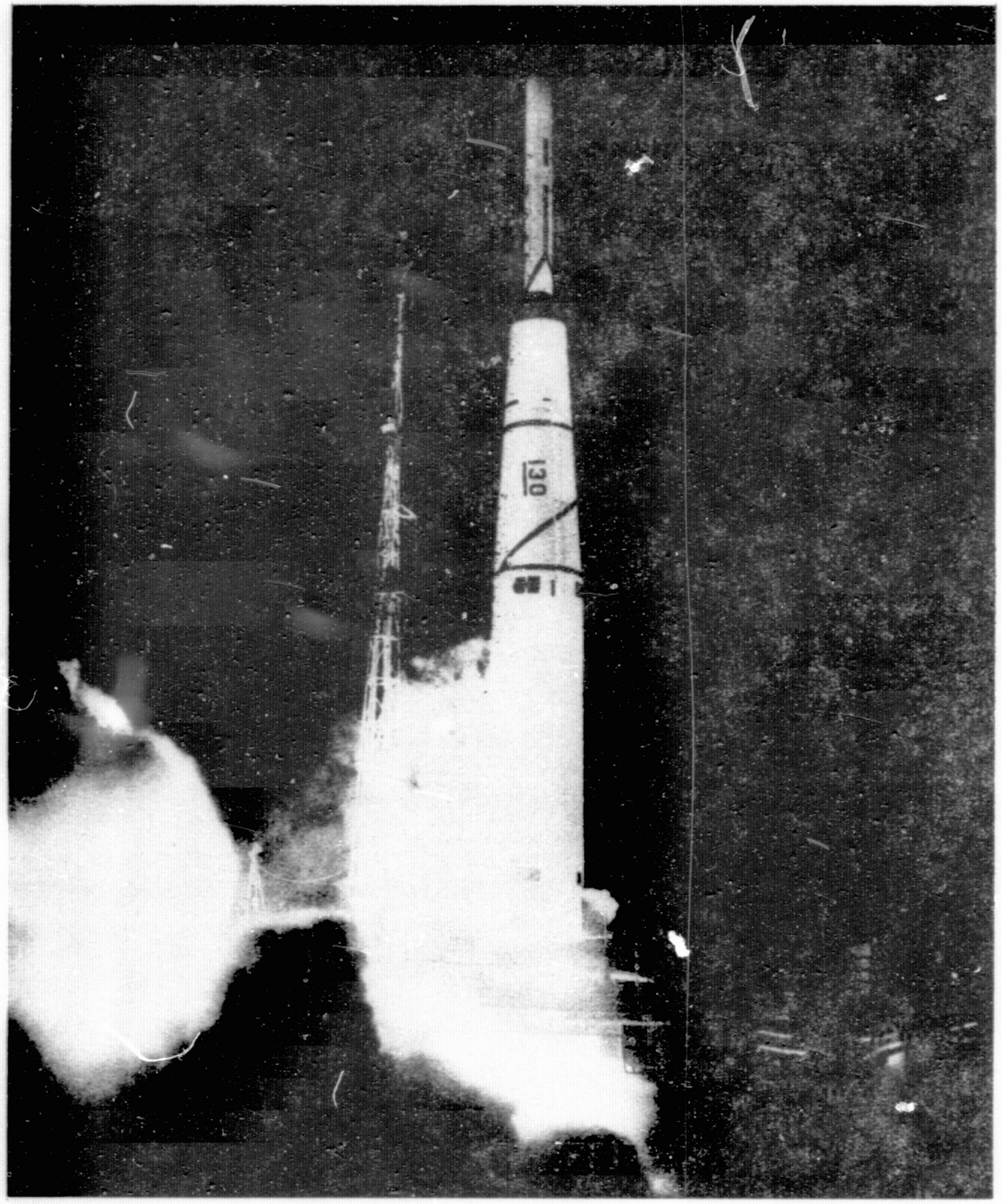
Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
Syncom II	26 Jul 63	Delta	A-26	ETR 17A	World's first satellite to achieve synchronous 24-hour orbit. Entered definite synchronous orbit over Brazil and the South Atlantic Ocean on August 15. Reached an altitude of 22,300 miles and a speed of 6,800 mph, matching the earth's rotation speed of 1,040 mph at the equator to keep it on station. Still in orbit. (S)
Syncom III	19 Aug 64	TAD	A-27 Syncom C	ETR 17A	Syncom III was launched into preliminary orbit and later maneuvered into synchronous orbit position over the Pacific above the Equator and the International Dateline. Live TV pictures of the Olympic Games in Tokyo were transmitted to the U.S. by Syncom III. Still in orbit. (S)
COMMERCIAL (COMSAT CORP.)					
Intelsat I (Early Bird 1)	6 Apr 65	TAD	EB-A	ETR 17A	First commercial satellite launched by NASA for ComSat Corp. on a reimbursable basis; up to 240 voice channels, television or high speed data between North America and Europe. Still in geostationary orbit over Atlantic, 27.5° west longitude. (S)

COMMUNICATIONS AND NAVIGATION PROGRAM
(continued)

Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
Intelsat II	26 Oct 66	TAD	F-1	ETR 17B	Purpose of Intelsat program was to place two separately launched spacecraft in 24 hour synchronous orbit for communication use. F-1 was to be the Pacific satellite. Launched by NASA under the contract with ComSat. The Apogee motor burned short giving the satellite an elliptical rather than a stationary orbit. Was usable for communications about 12 hours a day. Still in orbit. (P)
Intelsat II (Pacific I)	11 Jan 67	TAD	F-2	ETR 17B	Third ComSat commercial satellite, launched to take the place of Intelsat II F-1. Entered into geostationary orbit over the Pacific (176°E), it provided communications for NASA and commercial users. Still in orbit. (S)
Intelsat II (Atlantic 2)	22 Mar 67	TAD	F-3	ETR 17B	Fourth ComSat commercial satellite. Placed in geostationary orbit over the Atlantic at 5°W for communication service between North and South America and Europe. Still in Orbit. (S)
Intelsat II (Pacific 2)	27 Sep 67	TAD	F-4	ETR 17B	Fifth commercial communications satellite. Launched by NASA for ComSat to supplement and back-up Intelsat II F-2 (Pacific I). Still in geostationary orbit over Pacific at about 176°E. (S)

COMMUNICATIONS AND NAVIGATION PROGRAM
(continued)

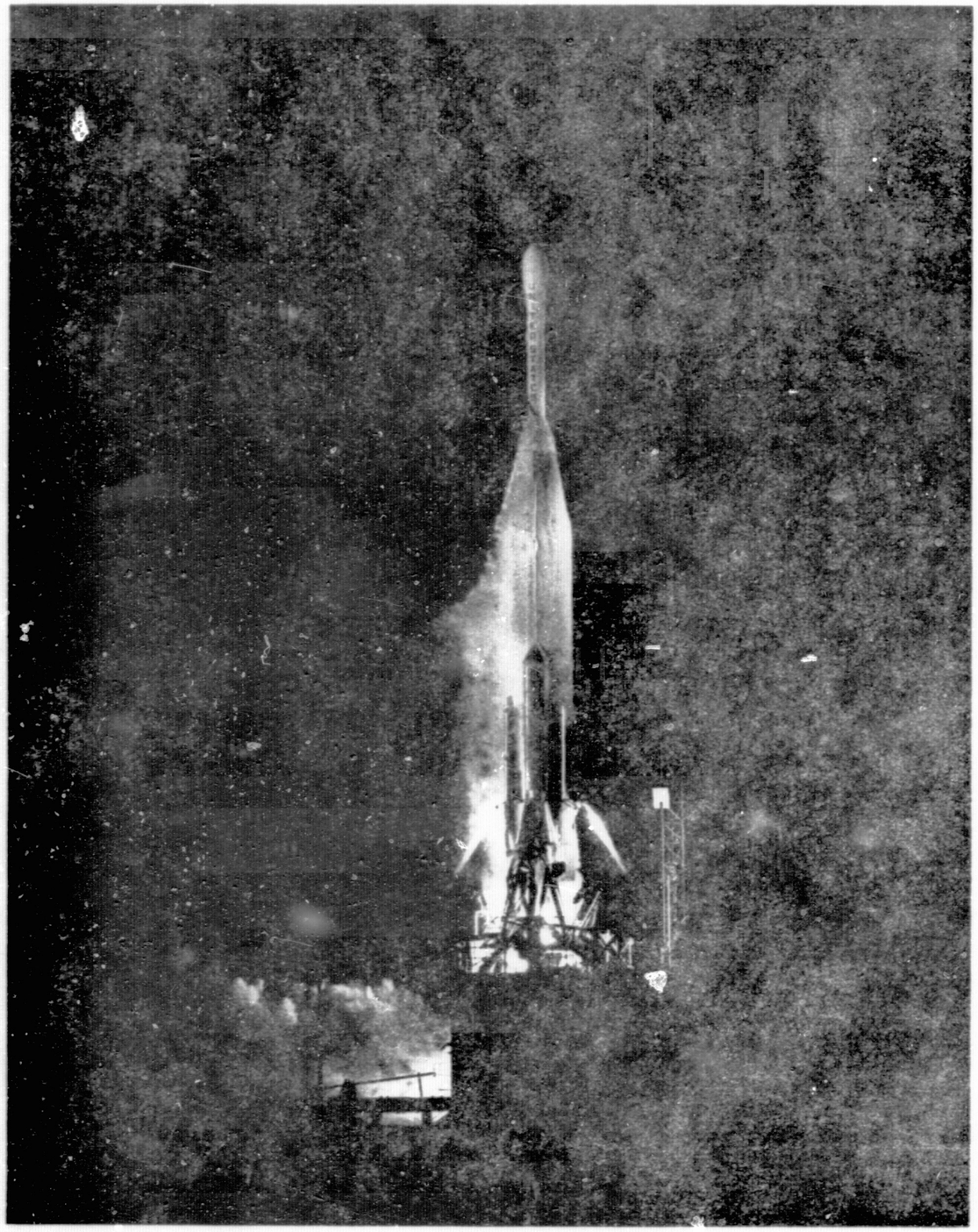
Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
Intelsat III	18 Sep 68	TAD	III-A	ETR 17A	First of three spacecraft planned to improve global communication network. Intelsat III's are designed to provide telecommunication service to all areas of the world via active satellite. Preliminary data indicated that at 102 seconds into the flight a malfunction developed in the pitch rate system in the first stage autopilot. The space vehicle was destroyed. This was the first of the long tank Delta configuration to be launched from the ETR. (U)



THOR-ABLE 11 OCTOBER 1958 PIONEER I

SCIENTIFIC LUNAR PROBES, ORBITERS, AND LANDERS

Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
PIONEER					
Pioneer I	11 Oct 58	Thor-Able	--	ETR 17A	Lunar probe. Uneven separation of second and third stages; reached altitude of 70,717 miles. Verified Van Allen Belt and returned other useful data before payload re-entered after 43 hours. (U)
Pioneer II	8 Nov 58	Thor-Able	--	ETR 17A	Lunar probe. Third stage failed to ignite; reached 963 miles. Brief data indicated that earth's equatorial region has higher flux and energy levels than previously believed. Suggested micrometeoroid density higher near earth than in space. (U)
Pioneer III	6 Dec 58	Juno II	--	ETR 5	Lunar probe. Premature cutoff of first stage, failed to produce required velocity for lunar probe. Reached altitude of 63,580 miles to contribute major scientific discovery of dual bands of radiation around the earth. Re-entered after 38 hours, 6 minutes. (U)



ATLAS-ABLE 15 DECEMBER 1958 PIONEER

SCIENTIFIC LUNAR PROBES, ORBITERS, AND LANDERS
(continued)

Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
Pioneer IV	3 Mar 59	Juno II	--	ETR 5	Lunar probe. Instrumented for space radiation measurements on Earth-moon trajectory; carried photo-electric scanner for use in vicinity of moon. Trajectory caused it to pass within 37,000 miles of moon; not close enough for scanner to function. Yielded excellent data on radiation in space. Was tracked for 82 hours to a distance of 407,000 miles (greatest tracking distance for man-made object to date) before going into permanent heliocentric (solar) orbit. (S)
Pioneer	26 Nov 59	Atlas-Able	--	ETR 14	Lunar probe. Payload shroud broke away 45 seconds after liftoff, satellite torn off. (U)
Pioneer	25 Sep 60	Atlas-Able	P-30	ETR 12	Lunar orbit attempt; failed to achieve trajectory due to second stage malfunction. (U)
Pioneer	15 Dec 60	Atlas-Able	P-31	ETR 12	Lunar orbit attempt; exploded 70 seconds after liftoff due to first stage malfunction. (U)

SCIENTIFIC LUNAR PROBES, ORBITERS, AND LANDERS
(continued)

Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
RANGER					
Ranger I	23 Aug 61	Atlas-Agena	P-32	ETR 12	Lunar probe. Injected into low earth orbit rather than planned deep space orbit due to failure of Agena stage to restart. Served as useful engineering test. Returned scant scientific data before re-entry on August 29, 1961. (U)
Ranger II	18 Nov 61	Atlas-Agena	P-33	ETR 12	Lunar probe. Placed in low earth orbit rather than programmed deep space orbit. Test of spacecraft achieved. Re-entered same day. (U)
Ranger III	26 Jan 62	Atlas-Agena	P-34	ETR 12	United States' first attempt to roughland separable instrumented capsule on lunar surface. Spacecraft injected into lunar transfer path at excessive velocity due to malfunction in Atlas guidance equipment. Arrived in area of the moon approximately 14 hours early, missing it by 22,862 miles. Provided first measurement of interplanetary gamma ray flux. Entered solar orbit. (U)

SCIENTIFIC LUNAR PROBES, ORBITERS, AND LANDERS
(continued)

Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
Ranger IV	23 Apr 62	Atlas-Agena	P-35	ETR 12	First lunar impact for a U.S. payload. Put into proper lunar impact trajectory by Agena restart, but failure of timer prevented controlled descent onto moon's surface and precluded accomplishment of engineering and scientific experiments. No mid-course correction. Crashed onto backside of moon on April 26, 1962. While full flight objectives were not achieved, a high order of performance in the Atlas-Agena/Ranger combination was demonstrated. (P)
Ranger V	18 Oct 62	Atlas-Agena	P-36	ETR 12	Spacecraft launched into proper lunar impact trajectory; after 15 minutes of normal operation, malfunction caused spacecraft to transfer from solar to battery power. Normal operation never resumed; battery power supply ran down after 8 hours, rendering spacecraft systems and experiments useless. Passed within 450 miles of moon and on into solar orbit; tracked to distance of 790,000 miles. (P)
Ranger VI	30 Jan 64	Atlas-Agena	Ranger A (P-53)	ETR 12	Successful launch but mission not accomplished due to failure of TV cameras which were to transmit 3,000 pictures of the moon at altitudes ranging from 900 to 4 miles. Ranger impacted in the Sea of Tranquility at 4:24 AM EST on February 2, precisely on schedule. (P)

SCIENTIFIC LUNAR PROBES, ORBITERS, AND LANDERS
(continued)

Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
Ranger VII	28 Jul 64	Atlas-Agena	Ranger B (P-54)	ETR 12	The 806 lb. spacecraft which carried six TV cameras was successfully placed into parking orbit, and later injected into lunar trajectory by restarting the Agena motor. During the last 15 minutes of flight, the cameras sent back 4,316 high quality photographs of the moon's surface. The final pictures were transmitted 2.3 seconds before impact on July 31, 1964. All aspects of the test were successful. (S)
Ranger VIII	17 Feb 65	Atlas-Agena	Ranger C	ETR 12	Lunar photography. 7,137 pictures obtained; impact occurred about 15 miles from target in Sea of Tranquility on February 20, 1965. (S)
Ranger IX	21 Mar 65	Atlas-Agena	Ranger D	ETR 12	Lunar photography. 5,814 pictures obtained, impact only a few miles from target in eastern floor of crater of Alphonsus, March 24, 1965. Pictures converted for live viewing on commercial TV. Final mission of Ranger series. (S)

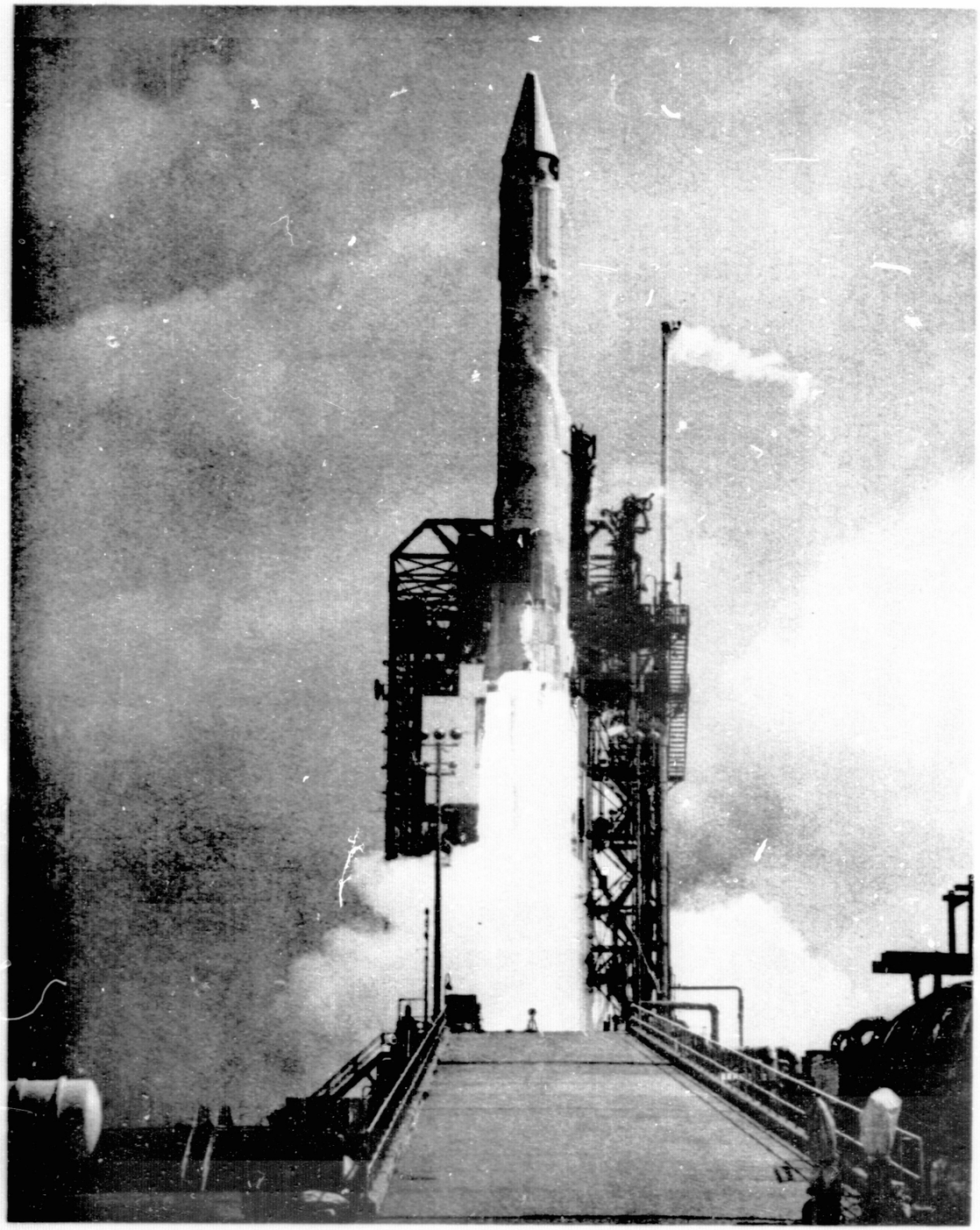
Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
LUNAR ORBITER					
Lunar Orbiter I	10 Aug 66	Atlas-Agena	LO-A	ETR 13	First of five planned missions to explore equatorial regions of moon to select area for Apollo landing. Put into lunar orbit at height of 117 to 1159 miles, later lowered to 25 miles at perilune. Total of 207 frames taken; high-resolution camera picture smeared, medium resolution excellent. Terminated by crashing into moon on October 29, 1966 to avoid conflict with LO-2. (S)
Lunar Orbiter II	6 Nov 66	Atlas-Agena	LO-B	ETR 13	Orbited Moon at perilune of 31 miles and photographed 13 primary target sites for Apollo landing. Returned 205 high-resolution photos before pictures stopped December 6 (one day early), when high-power transmission ceased. Also monitored radiation in lunar environment. Crashed on lunar surface October 11, 1967. (S)
Lunar Orbiter III	4 Feb 67	Atlas-Agena	LO-C	ETR 13	Lunar orbit at perilune of 34 miles. 211 pictures of Apollo and Surveyor sites taken (72% of planned) before malfunction in priority readout system caused termination on February 24. Also continued LO-B experiments. Crashed on lunar surface October 9, 1967. (S)

SCIENTIFIC LUNAR PROBES, ORBITERS, AND LANDERS
(continued)

Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
Lunar Orbiter IV	4 May 67	Atlas-Agena	LO-D	ETR 13	Near polar lunar orbit. Problems with Thermal Camera Door overcome. 99% coverage of lunar face and some of backside. Readout of photos completed June 1. Crashed on lunar surface October 6, 1967. (S)
Lunar Orbiter V	1 Aug 67	Atlas-Agena	LO-E	ETR 13	Lunar orbit at 62 mile perilune. Photographed Apollo target sites, areas of scientific interest, and backside areas not previously covered. Photo readout completed August 28. Still in lunar orbit. (S)
SURVEYOR					
Surveyor I	30 May 66	Atlas-Centaur	Surveyor A	ETR 36A	Soft landed on Moon in the Ocean of Storms, June 2, proving capability of launch vehicle and spacecraft. Returned thousands of high-quality pictures. Selenological data obtained on morphology and lunar origin. Completed mission July 13. (S)
Surveyor II	20 Sep 66	Atlas-Centaur	Surveyor B	ETR 36A	Intended to demonstrate soft lunar landing and provide data for Apollo program. Flight successful until midcourse maneuver, when one of three vernier engines failed to ignite, causing spin. Data obtained on spacecraft performance until it crashed on Moon September 22. (P)

SCIENTIFIC LUNAR PROBES, ORBITERS, AND LANDERS
(continued)

Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
Surveyor III	17 Apr 67	Atlas-Centaur	Surveyor C	ETR 36B	Soft landed on Moon within Apollo landing area. Returned TV pictures and obtained data on lunar surface by digging up a sample with a claw. On basis of data, scientists concluded that lunar soil has consistency similar to wet sand, with a bearing strength of 10 psi, firm enough for Apollo LM landing. Experiments stopped May 2, when lunar night began. (S)
Surveyor IV	14 Jul 67	Atlas-Centaur	Surveyor D	ETR 36A	Carried a surface claw similar to Surveyor III, with a magnet in the claw to measure ferrous elements in lunar soil. Flight was successful until all communications with Surveyor IV were lost 2 seconds before retrorocket burnout, 2½ minutes before landing. Scientists theorize that Surveyor IV spacecraft exploded. (P)



ATLAS-CENTAUR 30 MAY 1966 SURVEYOR I

SCIENTIFIC LUNAR PROBES, ORBITERS, AND LANDERS
(continued)

Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
Surveyor V	8 Sep 67	Atlas-Centaur	Surveyor E	ETR 36B	Soft landed on Moon in Sea of Tranquility on September 10. Spacecraft, landed on inner slope of small crater, about 30 feet in diameter and 4½ feet deep, with the TV camera about 20 inches above crater's rim. Returned TV pictures of surface, some in color. Conducted a vernier engine experiment to investigate erosion from rocket's flame. Obtained touchdown dynamics, thermal and radar reflectivity data on lunar surface. Performed alpha scattering experiments to determine relative abundance of elements in lunar soil. Shutdown for lunar night on September 24. (S)
Surveyor VI	7 Nov 67	Atlas-Centaur	Surveyor F	ETR 36B	Soft landed in Sinus Medii near Apollo Site II P-8 (3) November 9, after 53 hours, 22 minutes flight from Earth. Transmitted over 30 thousand pictures to Earth during first lunar day operations. Besides surveying lunar surface, also photographed Earth, Jupiter, and the stars Canopus, Capella, Sirius and Vega. Obtained data on touchdown dynamics, thermal and radar reflectivity of lunar surface, and relative abundance of chemical elements in lunar soil. On November 17, spacecraft's three vernier engines were restarted and Surveyor VI was lifted about 13 feet off the lunar surface and translated a horizontal distance of about 10 feet. Shutdown for lunar night on November 24, 1967. (S)

SCIENTIFIC LUNAR PROBES, ORBITERS, AND LANDERS
(continued)

Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
Surveyor VII	7 Jan 68	Atlas-Centaur	Surveyor G	ETR 36A	Last spacecraft of current Surveyor series. Successfully launched from Cape Kennedy at 0130 EST (within one second of the desired liftoff time) into a direct ascent lunar trajectory, which required only a single midcourse correction maneuver. Soft landed near crater Tycho at 2005 EST January 9, 1968 after a flight of 66 hours, 34 minutes. Landing site (40.89 S. latitude, 11.44 W. longitude) was about 1.5 miles from aiming point. Returned over 21,000 television pictures, including some stereo pictures, of lunar surface and lunar rocks of special geological interest during first lunar day operations. On two different occasions, Surveyor camera detected laser beams directed from Earth towards the spacecraft. Also, photographed Earth and Jupiter. Returned telemetry data on lunar surface, similar to Surveyors I, III, V, and VI. Spacecraft was shutdown for its first lunar night on January 22, 1968. (S)

SCIENTIFIC DEEP SPACE AND PLANETARY PROBES

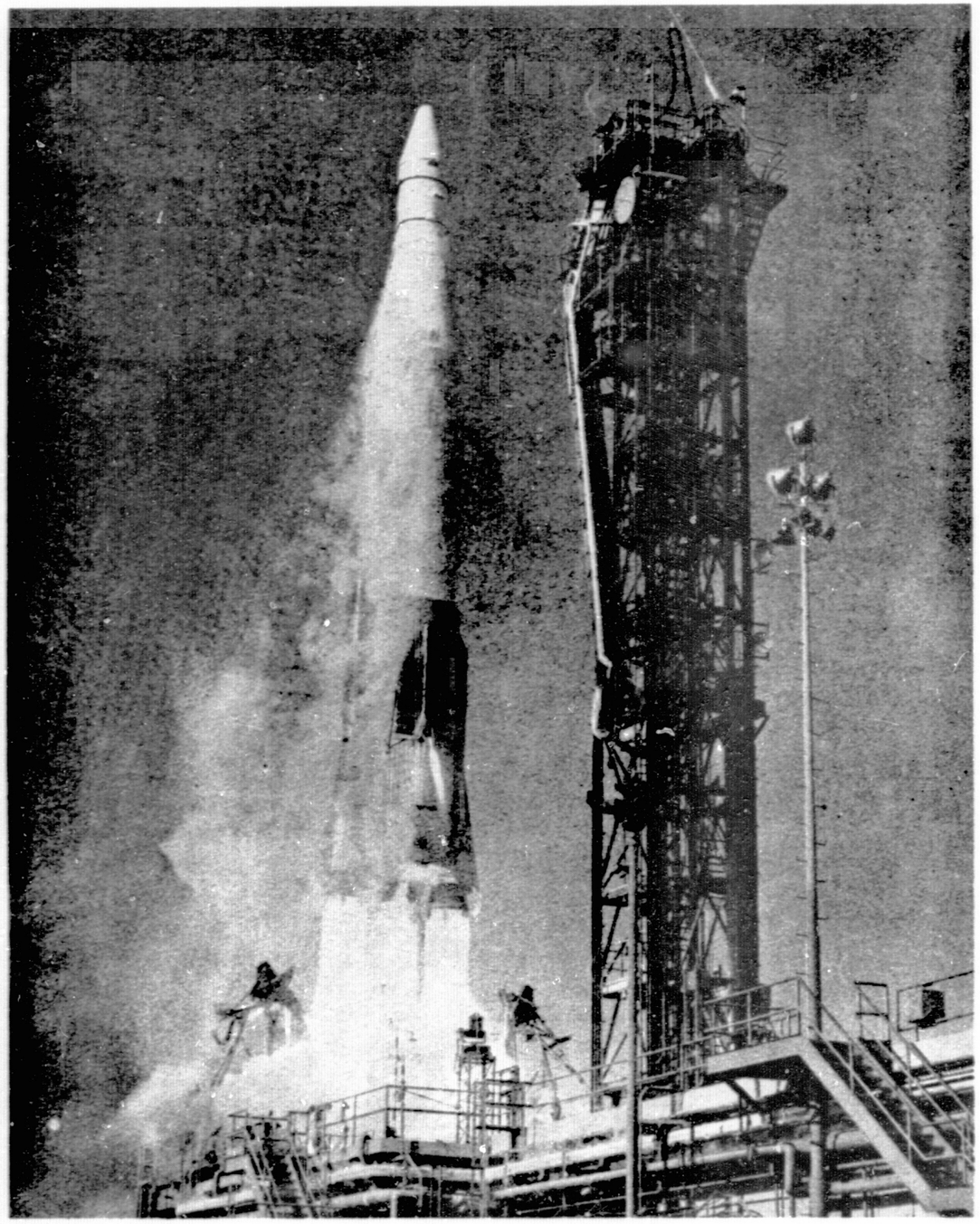
Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
PIONEER					
Pioneer V	11 Mar 60	Thor-Able	--	ETR 17A	Highly successful exploration of interplanetary space between orbits of Earth and Venus; produced first data on nature of interplanetary space; established communication record of 22.5 million miles on June 26, 1960, a record unmatched until Mariner II. First radio communication at interplanetary distances. In solar orbit. (S)
Pioneer VI	16 Dec 65	TAD	Pioneer A	ETR 17A	Study of interplanetary phenomena in space. Provided simultaneous scientific measurements at widely separated points in heliocentric orbit in interplanetary space to provide data on interplanetary environment for U.S. advanced space program. (S)
Pioneer VII	17 Aug 66	TAD	Pioneer B	ETR 17A	Heliocentric orbit, measuring solar magnetic field, solar wind, and cosmic rays. Like Pioneer VI, continued measurements of solar activity at widely separated points in interplanetary space. Orbit of 403 days. (S)

SCIENTIFIC DEEP SPACE AND PLANETARY PROBES
(continued)

Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
Pioneer VIII	13 Dec 67	Delta	Pioneer C	ETR 17B	Third mission in current Pioneer Program of scientific interplanetary exploration of a continuing basis. Spacecraft similar in appearance to Pioneers VI and VII but contains different experiments. Intended to collect data including magnetic field, plasma, and cosmic ray measurements in a heliocentric (Sun-centered) orbit for a period covering two or more passages of solar activity centers. Will also aid in providing a synoptic study of solar-interplanetary relations by (a) long-term observations using the Pioneer series, and (b) correlative measurements between these spacecraft. Was launched in a path ahead of Earth to give spacecraft added velocity in solar orbit to move out beyond the orbit of Earth. All experiments working properly following orbital injection. Reached Earth's magnetospheric boundary at approximately 1400 EST, December 15, 1967. On January 18, 1968 Sun, Earth and spacecraft were aligned, with spacecraft about two million miles from Earth, thus providing opportunity for further investigation of Earth's magnetic tail (first performed by Pioneer VII in September 1966). Early tracking data indicates Pioneer VIII will reach an aphelion (furthest point from Sun) of 1.088 A.U., or 101,136,467.81 miles, and a perihelion (closest point to Sun) of 0.9892 A.U., or 91,952,402.34 miles.

SCIENTIFIC DEEP SPACE AND PLANETARY PROBES
(continued)

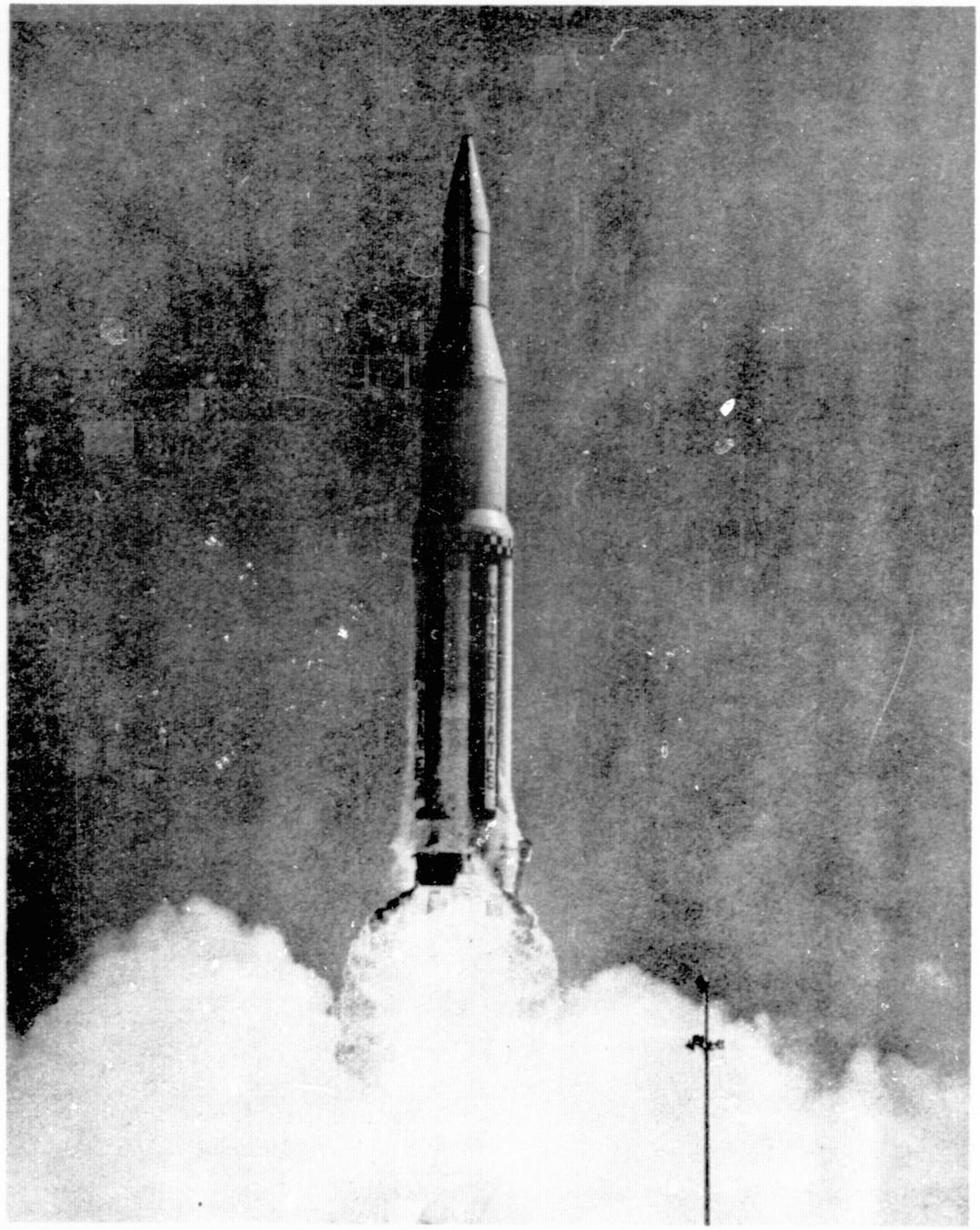
Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
MARINER					
Mariner I	22 Jul 62	Atlas-Agena	P-37	ETR 12	Attempted Venus probe, the booster deviated from course and was destroyed by the range safety officer 290 seconds after launch. (U)
Mariner II	27 Aug 62	Atlas-Agena	P-38	ETR 12	First spacecraft to scan another planet; passed within 21,600 miles of planet Venus on December 14, and made a 42 minute instrument scan of Venusian atmosphere and surface before continuing into heliocentric orbit. Transmissions from interplanetary experiments received until January 4, 1963 from 54.3 million miles distance, establishing a new communication record. (S)
Mariner III	5 Nov 64	Atlas-Agena	Mariner 64C	ETR 13	Planetary exploration to the vicinity of Mars. The shroud failed to jettison; battery power dropped and there was no evidence to indicate that the solar panels opened to replenish the power supply; communications were lost. In permanent heliocentric orbit. (U)
Mariner IV	28 Nov 64	Atlas-Agena	Mariner 64D	ETR 12	Planetary and interplanetary exploration. Mars trajectory. Flyby occurred July 14, 1965 with closest approach between five and six thousand miles. 22 pictures were taken. In heliocentric orbit. (S)
Mariner V	14 Jun 67	Atlas-Agena	Mariner E	ETR 12	Purpose is to conduct a single flyby mission to Venus in 1967 to complement and extend results of Mariner II. 540 lb. spacecraft. Planned to pass within 2,500 miles of Venus on October 19. Will measure the planet's magnetic field, ionosphere, and radiation belts and temperature. Will be cut off from transmitting 10 days later. (S)



ATLAS 14 APRIL 1964 FIRE I

PROJECT FIRE

Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
Fire I	14 Apr 64	Atlas	--	ETR 12	First launch of Project Fire re-entry vehicle in support of Project Apollo. Designed to investigate re-entry at escape speeds and beyond. Re-entry speed reached 25,750 miles per hour; heating reached 11,200 degrees K, instead of the planned 11,300 degrees due to lower re-entry angle of 14.5 degrees instead of the planned nominal 15 degrees. Impacted 200 miles south of Ascension Island after a 32 minute flight. Test objectives achieved. (S)
Fire II	22 May 65	Atlas	--	ETR 12	Re-entry test. Fire II spacecraft, similar in shape to an Apollo command module, was launched into a ballistic trajectory to test re-entry heating of a spacecraft returning from the moon. Re-entry velocity of approximately 25,000 miles per hour. Second and last flight of Fire program. (S)



LAUNCH VEHICLE DEVELOPMENT TESTS

Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
SATURN					
Saturn	27 Oct 61	Saturn C-1	SA-1	ETR 34	Successful initial flight test of first stage. Take-off thrust achieved was 1,296,000 pounds. Hurled two water-filled, dummy upper stages, carried as ballast, to peak altitude of 84.8 miles and distance of 214.7 miles down range. Reached maximum velocity of 3,607 miles per hour before plunging into ocean 8 minutes after launch. (S)
Saturn	25 Apr 62	Saturn C-1	SA-2	ETR 34	Like first Saturn, fired only first stage engines, generating 1.3 million pounds of thrust. Dummy upper stages filled with water were detonated at 65 mile altitude (Project Highwater) and formed artificial cloud. All test objectives achieved. (S)
Saturn	16 Nov 62	Saturn C-1	SA-3	ETR 34	First stage only; coasted to 104 mile altitude where it was destroyed to release 95 tons of water ballast into the atmosphere, forming a huge ice cloud (Project Highwater). All test objectives achieved. (S)
Saturn	28 Mar 63	Saturn I	SA-4	ETR 34	First stage only. One engine purposely shut off after 100 seconds to determine "engine-out" capability. Last of four first stage tests. (Officially designated Saturn I on February 7, 1963.) (S)

LAUNCH VEHICLE DEVELOPMENT TESTS
(continued)

Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
Saturn	29 Jan 64	Saturn I	SA-5	ETR 37B	First successful test flight of the new Block II vehicles which have powered second stages. Eight H-1 engines of the first stage operated at a rated capacity of 188,000 lb. each for a total of 1,505,000 lb. of thrust. The six engines of the second stage ignited as planned at T-plus 149 seconds and delivered a total of 90,000 lb. of thrust. The orbited body weighed 37,700 lb., nearly 20,000 lb. of which was payload. During flight, eight onboard motion picture cameras and one TV camera provided the most elaborate optical instrumentation ever carried on a launch vehicle to date. Seven of the eight motion picture cameras that were ejected were successfully recovered. Test proved flight capability of Saturn I's liquid-hydrogen, clustered engine upper stage and demonstrated the vehicle's capability to orbit 20,000 pound payload. Re-entered April 30, 1966. (S)

LAUNCH VEHICLE DEVELOPMENT TESTS
(continued)

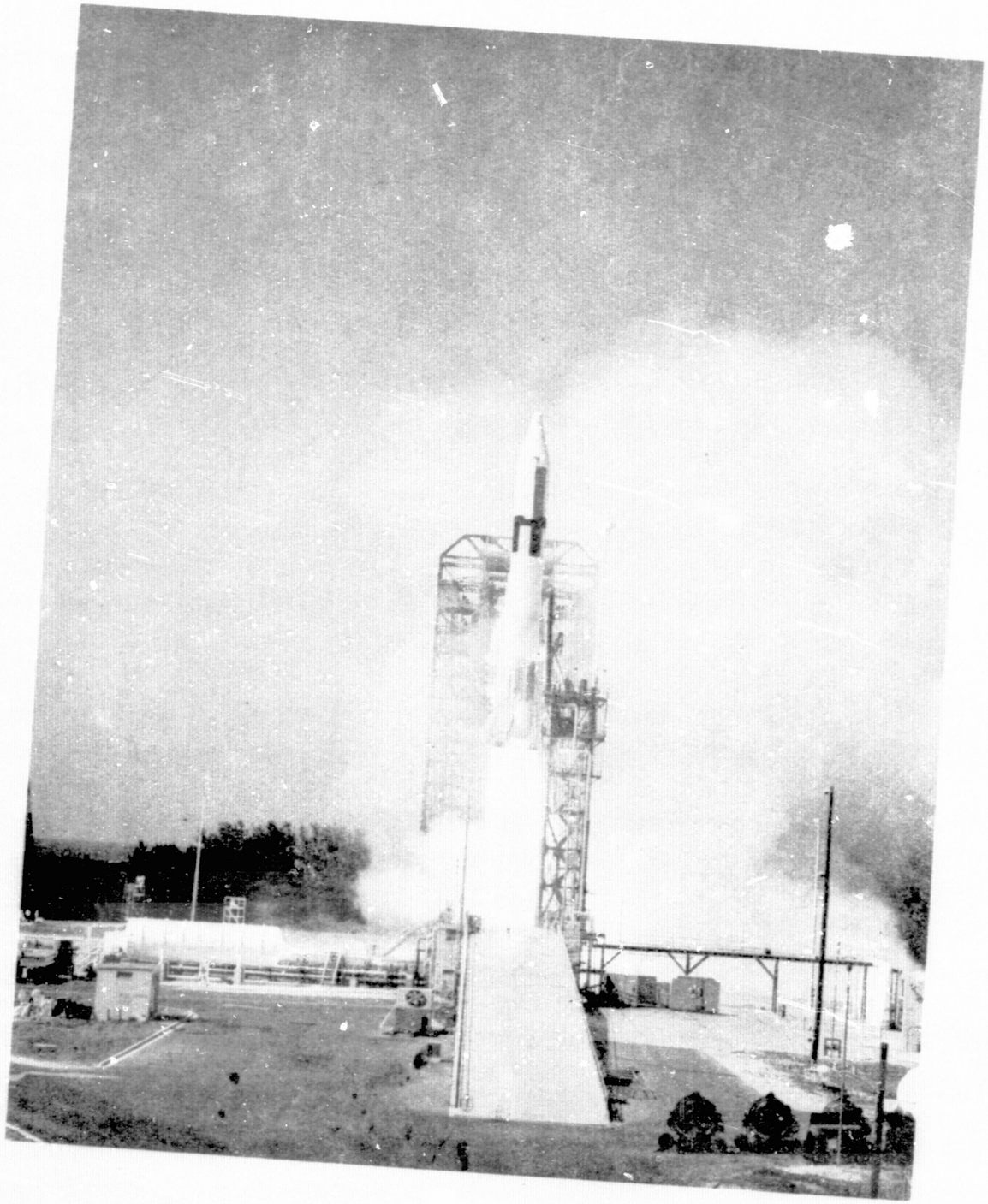
Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
Saturn	28 May 64	Saturn I	SA-6	ETR 37B	First major flight test in Project Apollo with successful orbiting of first boilerplate Apollo spacecraft. The payload consisted of the boilerplate and the S-IV second stage; re-entered atmosphere and disintegrated over the western Pacific during its 50th orbit of the Earth on June 1, 1964. One mission highlight was the perfect performance of the ST-124 guidance platform, which controlled the second stage during flight. One first stage engine shut down 24 seconds early, but deviation from the planned trajectory was corrected by the SA-6 guidance system. Test considered highly successful. (S)
Saturn	18 Sep 64	Saturn I	SA-7	ETR 37B	Boilerplate Apollo spacecraft command and service modules, instrument unit and S-IV stage were placed in orbit. All major test objectives were met. Motion picture cameras and a TV camera mounted on the S-I stage recorded flight events. However, the motion pictures were ejected near a hurricane area and recovery was not attempted. Re-entered atmosphere on September 22, 1964. (S)

LAUNCH VEHICLE DEVELOPMENT TESTS
(continued)

Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
Saturn/ Pegasus I	16 Feb 65	Saturn I	SA-9	ETR 37B	Spacecraft used to detect micrometeoroids, the first primary use of capacitor-type penetration detector. Sensor area, 2,000 sq. ft. Still in orbit; still transmitting. (S)
Saturn/ Pegasus II	25 May 65	Saturn I	SA-8	ETR 37B	Near earth micrometeoroid environment data obtained; test of Saturn launch vehicle. Ninth successful test in nine flights for Saturn I. Still in orbit; still transmitting. (S)
Saturn/ Pegasus III	30 Jul 65	Saturn I	SA-10	ETR 37B	Last of current Pegasus program. Continued study of distribution, size, and velocity of meteoroids in near earth orbit, and continued development of Saturn I vehicle. Still in orbit; still transmitting. (S)

NOTE

Further development tests of Saturn launch vehicles (Saturn IB and Saturn V) were conducted as space vehicle (launch vehicle plus spacecraft) development flights. These tests were designated as official Project Apollo missions, and may be found under that listing.



ATLAS CENTAUR 8 MAY 1962 F-1

LAUNCH VEHICLE DEVELOPMENT TESTS
(continued)

Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
CENTAUR					
Centaur	8 May 62	Atlas-Centaur	F-1	ETR 36A	Exploded 55 seconds after launch, apparently due to a structural failure which resulted in a fuel tank rupture. Vehicle destroyed before separation. (U)
Centaur	27 Nov 63	Atlas-Centaur	AC-2	ETR 36A	First successful launch of Centaur; first known ignition of liquid-hydrogen fueled rocket engines in space. Centaur did not carry an instrumented payload on this space flight. Still in orbit. (S)
Centaur	30 Jun 64	Atlas-Centaur	AC-3	ETR 36A	Technical problems caused preliminary shutdown of two 15,000 lb. thrust RL-10 engines 127 seconds before programmed burning time of 380 seconds elapsed. Flight objectives which were attained included successful jettison of insulation panels and nose fairings, separation of the Atlas and Centaur stages, and demonstration of guidance system operations. AC-3 achieved maximum velocity of 11,425 miles per hour and an altitude of 345 miles. (P)
Centaur	11 Dec 64	Atlas-Centaur	AC-4	ETR 36A	Carried model of Surveyor spacecraft. All primary mission objectives met; however, secondary test of second burn not accomplished. Re-entered atmosphere December 12, 1964. (S)

LAUNCH VEHICLE DEVELOPMENT TESTS
(continued)

Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
Centaur	2 Mar 65	Atlas-Centaur	AC-5	ETR 36A	First attempt to place a Surveyor dynamic model into a simulated lunar transfer trajectory. Seconds after liftoff the Atlas booster failed due to the closing of a fuel line valve. (U)
Centaur	11 Aug 65	Atlas-Centaur	AC-6	ETR 36B	Test for vehicle development. Fourth successful Atlas-Centaur launch; accurately put a Surveyor dynamic model into a simulated lunar trajectory; demonstrated capability of guidance system. Still in orbit. (S)
Centaur	7 Apr 66	Atlas-Centaur	AC-8	ETR 36B	Vehicle development test. Seventh Atlas-Centaur development flight. Major objective; simulate lunar transfer trajectory using parking orbit, "two burn" indirect ascent. Nominal second burn not achieved. Payload, a Surveyor mass model. Re-entered atmosphere May 5, 1966. (U)
Centaur	26 Oct 66	Atlas-Centaur	AC-9	ETR 36B	Final R&D of Centaur. Primary objective was restarting of Centaur engines after a coast phase in orbit. AC-8 had failed in this. Liquid-hydrogen proved satisfactory, success meant that remaining 10 vehicles in the series would be flown on operational missions. A surveyor mass model was injected into a simulated lunar transfer orbit. Re-entered atmosphere November 6, 1966. (S)

PROJECT MERCURY (FLIGHTS AND TESTS)

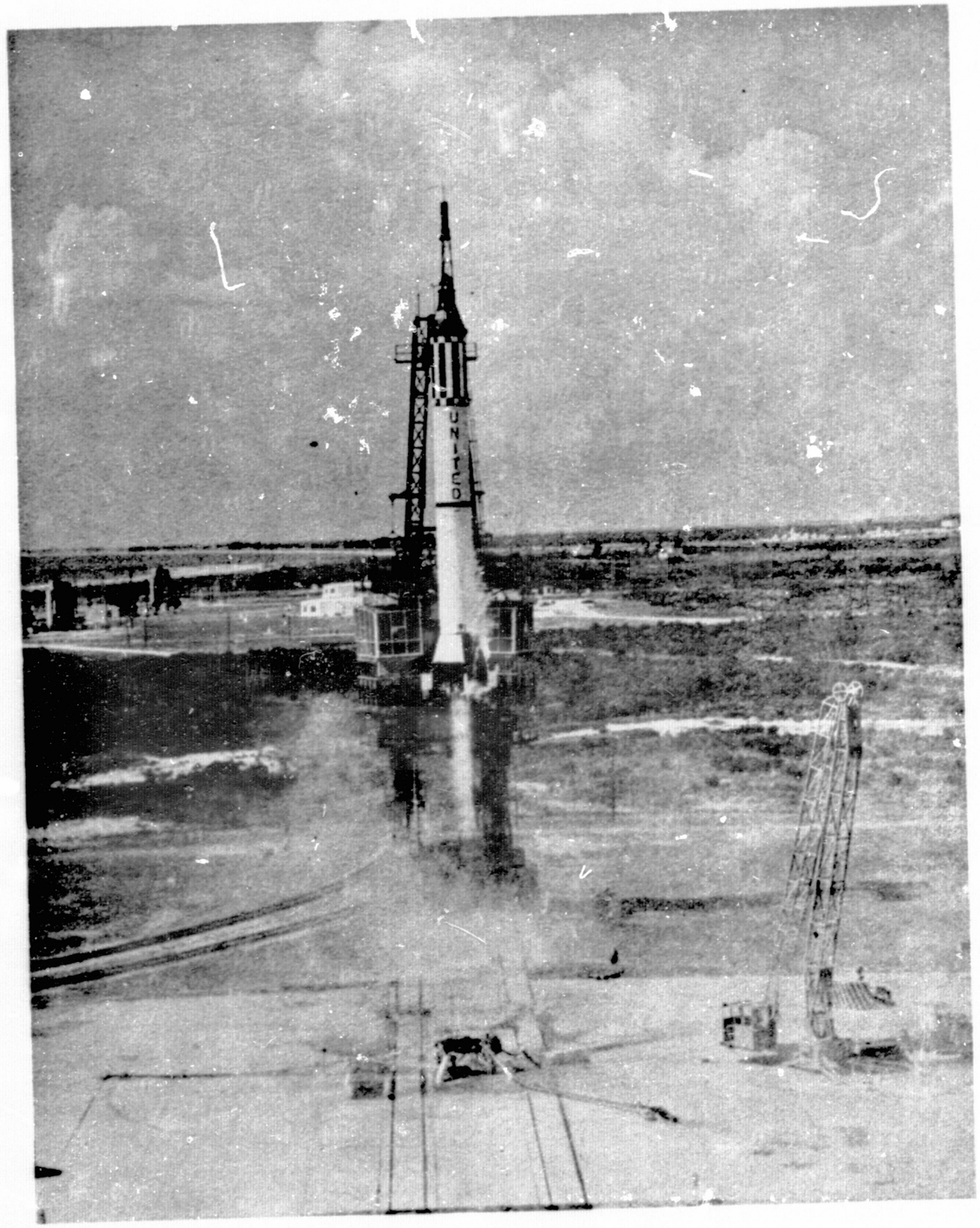
Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
SUBORBITAL (Unmanned)					
Big Joe	9 Sep 59	Atlas-Big Joe	--	ETR 14	Full-scale instrumented boilerplate model of Mercury capsule reached an altitude of 100 miles in re-entry test. Capsule recovered after surviving re-entry heat of more than 10,000° F. (S)
Mercury	29 Jul 60	Mercury-Atlas	MA-1	ETR 14	Launch of Mercury production capsule by an Atlas ended in failure when malfunction occurred one minute after liftoff, resulting in destruction of launch vehicle. (U)
Mercury	21 Nov 60	Mercury-Redstone	MR-1	ETR 5	Note: Generally not considered a launch, MR-1 rose one inch, stopped firing, and settled back on pad. Premature booster cutoff, triggered by faulty ground support circuitry, resulted in engine shutdown immediately after ignition, and ignition of escape tower rockets. Capsule was used again in MR-1A launch on December 19, 1960 with a different booster. (U)

PROJECT MERCURY (FLIGHTS AND TESTS)
(continued)

Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
Mercury	19 Dec 60	Mercury-Redstone	MR-1A	ETR 5	Repeat of MR-1 flight mission was successful and all major objectives fulfilled. Capsule re-entered and landed in target area 235 miles down range after reaching an altitude of 135 miles and speed up to 4,300 miles per hour. Capsule recovered in excellent condition 48 minutes after launch. (S)
Mercury	31 Jan 61	Mercury-Redstone	MR-2	ETR 5	Successfully launched, fully equipped, operational Mercury capsule containing 37 pound chimpanzee named "Ham" on 16 minute suborbital flight to altitude of 156 miles and over a distance of 420 miles. Excessive booster velocity carried spacecraft higher and farther than programmed, but mission objectives--flight test of capsule and its life-support system--was achieved when spacecraft and passenger were recovered in satisfactory condition. (S)

PROJECT MERCURY (FLIGHTS AND TESTS)
(continued)

Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
Mercury	21 Feb 61	Mercury-Atlas	MA-2	ETR 14	Successful 1,425 mile flight test of Mercury capsule. Atlas shutdown prematurely to simulate an abort. After separation, capsule coasted to altitude of 107 miles; automatic stabilization and control system oriented capsule for steep entry. Attained maximum velocity of 12,850 miles per hour. Landed in Atlantic Ocean 18 minutes after liftoff, sighted by search aircraft 4 minutes after landing, and recovered in excellent condition shortly thereafter. Mercury-Atlas combination functioned smoothly during severe test, which was an essential step before manned orbital flights could be attempted. (S)
Mercury	24 Mar 61	Mercury-Redstone	MR-BD	ETR 5	Booster development test flight to verify modifications necessitated by MR-2 flight. Modified Redstone carried boilerplate Mercury capsule to an altitude of 115 miles and distance of 311 miles down range; test did not call for separation or recovery of capsule. Completely successful flight qualified Redstone for manned suborbital flights. (S)


UNITED

PROJECT MERCURY (FLIGHTS AND TESTS)
(continued)

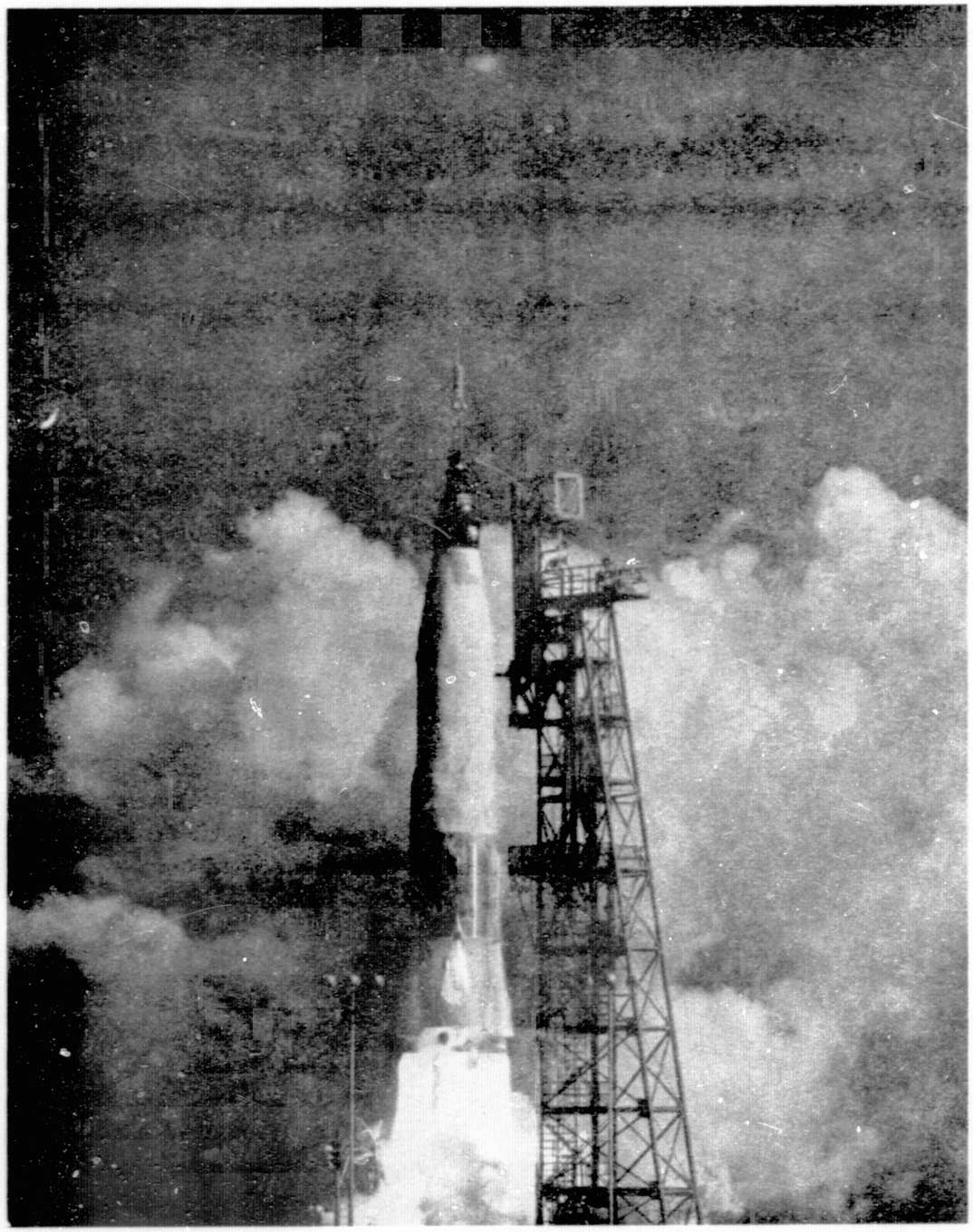
Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
SUBORBITAL (MANNED)					
Freedom 7	5 May 61	Mercury-Redstone	MR-3	ETR 5	First U.S. suborbital manned space flight. After reaching peak altitude of 116 miles and velocity of 5,180 miles per hour, Mercury capsule, manned by astronaut Alan B. Shepard, Jr., landed in Atlantic Ocean 302 miles down range following 14.8 minute flight. All phases of flight were normal; astronaut and capsule recovered by helicopter within 6 minutes of landing and placed aboard recovery vessel within 11 minutes. Astronaut underwent 5 minutes of weightlessness and experienced maximum acceleration of 11 times normal gravity on re-entry. Carried out all tasks as assigned, demonstrating that man can control a vehicle during weightlessness and high G stresses, and suffer no adverse physiological effects. (S)

PROJECT MERCURY (FLIGHTS AND TESTS)
(continued)

Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
Liberty Bell 7	21 Jul 61	Mercury-Redstone	MR-4	ETR 5	Second U.S. suborbital manned space flight. Spacecraft, manned by astronaut Virgil I. Grissom, made successful 15 minute, 118 mile high, and 303 mile flight down range. All phases of flight were normal; however, due to inadvertent firing of explosive hatch, capsule filled with water and sank. Astronaut egressed and was recovered and, with exception of missing capsule, all missions were successfully accomplished. Analysis of data indicated that all objectives of suborbital phase of Project Mercury had been achieved and no further suborbital flights were necessary. (S)
ORBITAL (UNMANNED)					
Mercury	25 Apr 61	Mercury-Atlas	MA-3	ETR 14	Attempted orbital capsule test. Atlas did not follow programmed flight path immediately after liftoff and was destroyed by range safety action at approximately 16,400 feet. Mercury capsule boosted clear of Atlas by escape tower rockets and was recovered intact. Provided thorough test of abort and recovery systems. (U)

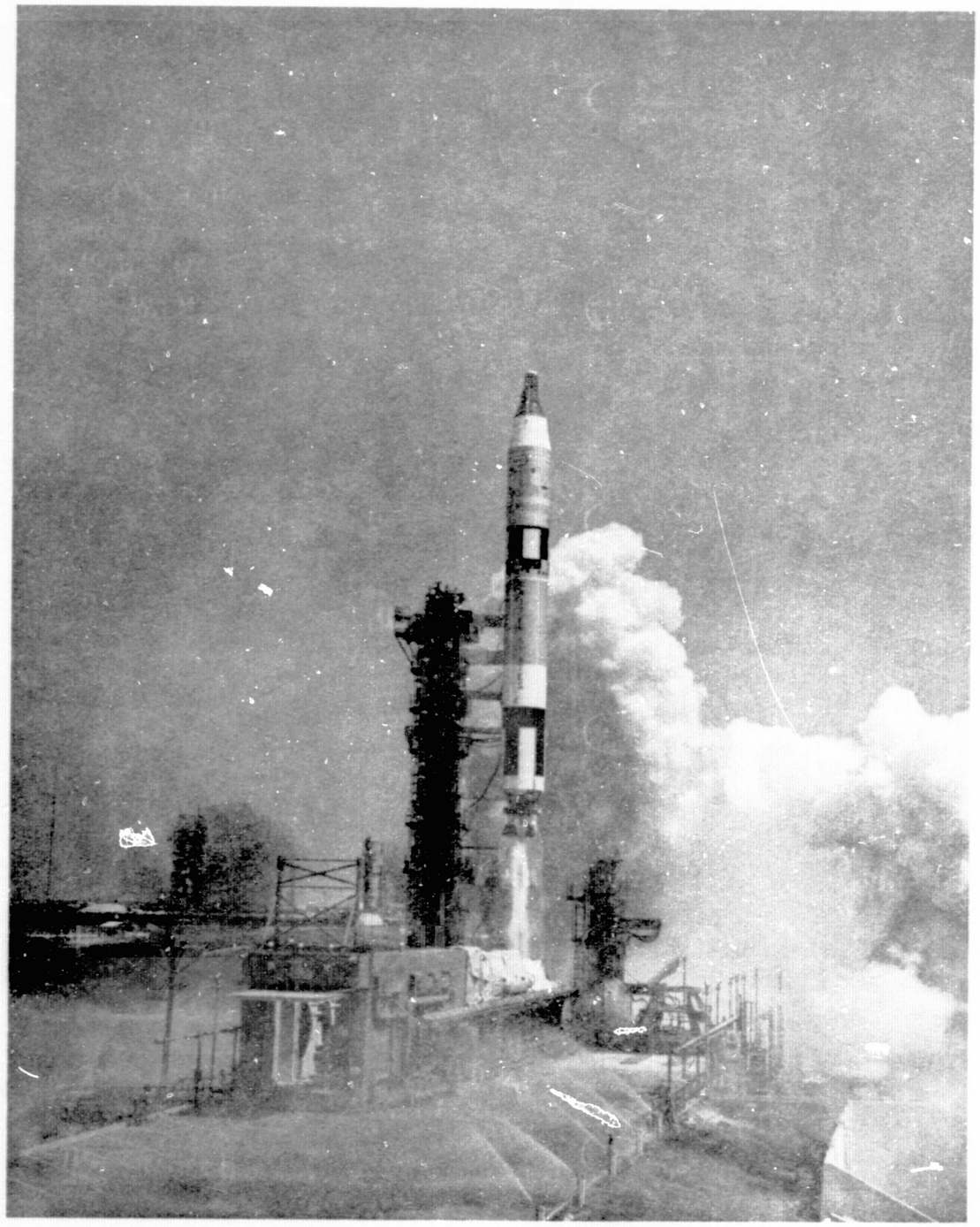
PROJECT MERCURY (FLIGHTS AND TESTS)
(continued)

Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
Mercury	13 Sep 61	Mercury-Atlas	MA-4	ETR 14	Successfully completed one orbit. Capsule was recovered. Checked Mercury world-wide tracking network. (S)
Mercury	1 Nov 61	Mercury-Scout	MS-1	ETR 18B	Destroyed by range safety action 30 seconds after liftoff. Air Force launched; had been intended as test of global Mercury tracking network. (U)
Mercury	29 Nov 61	Mercury-Atlas	MA-5	ETR 14	Scheduled three orbit flight to test all Mercury systems. Spacecraft, carrying chimpanzee, completed two orbits when re-entry was commanded due to development of abnormal roll rate. Capsule was recovered 1 hour and 25 minutes after water landing, and well-performing "Enos" was recovered in excellent condition. (S)
ORBITAL (MANNED)					
Friendship 7	20 Feb 62	Mercury-Atlas	MA-6	ETR 14	First U.S. orbital manned space flight. Mercury spacecraft, manned by John H. Glenn, Jr., completed three orbits in 81,000 mile flight lasting 4 hours, 56 minutes. Splash down in Atlantic Ocean 166 miles east of Grand Turk Island. Astronaut remained inside capsule until on deck of recovery vessel. Flight provided significant aerospace medical data during 285 minutes of weightlessness. Astronaut piloted spacecraft during second and third orbits due to automatic pilot difficulties. (S)



PROJECT MERCURY (FLIGHTS AND TESTS)
(continued)

Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
Aurora 7	24 May 62	Mercury-Atlas	MA-7	ETR 14	Second U.S. orbital manned space flight with M. Scott Carpenter as pilot, was placed into orbit at 17,532 miles per hour. 81,200 mile flight featured attitude stabilization and control pilotage for completion of three orbits. Re-entry error caused landing 200 miles beyond intended area; astronaut egressed through top of capsule to await rescue three hours later. (S)
Sigma 7	3 Oct 62	Mercury-Atlas	MA-8	ETR 14	Walter M. Schirra, Jr., traveled 160,000 miles in Mercury spacecraft, completing nearly six orbits and returning to earth at predetermined point in Pacific Ocean about 9 hours, 14 minutes after launch. Safely aboard recovery vessel within 37 minutes after landing. Flight proved feasibility of prolonged weightlessness in space. (S)
Faith 7	15 May 63	Mercury-Atlas	MA-9	ETR 14	Astronaut L. Gordon Cooper, manning Mercury spacecraft, completed 22 orbits, traveling approximately 593,885 miles in 34 hours, 20 minutes. Astronaut and spacecraft recovered only 36 minutes after splash down in Pacific Ocean. (S)



PROJECT GEMINI (FLIGHTS AND TESTS)

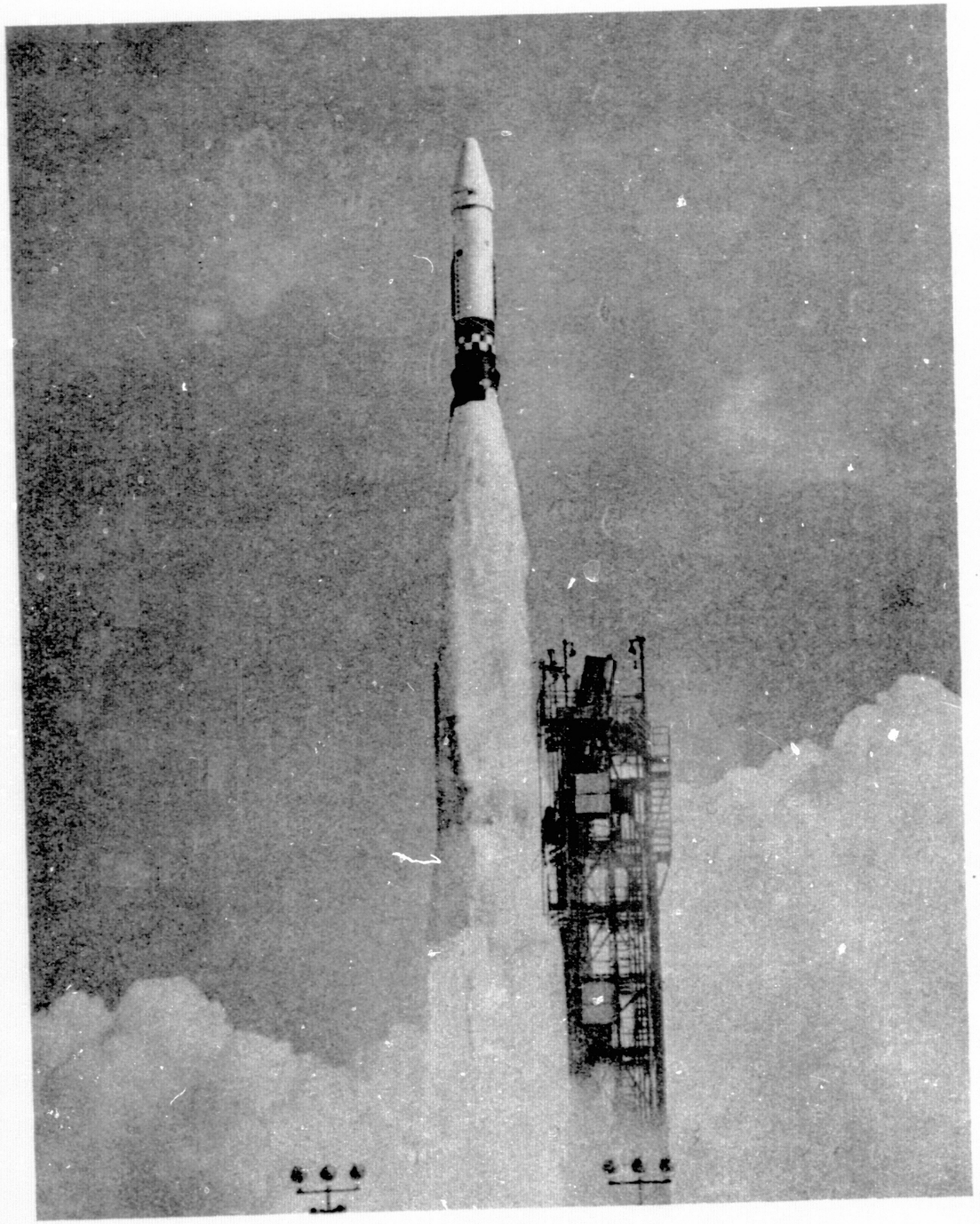
Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
GEMINI (UNMANNED)					
Gemini I	8 Apr 64	Gemini-Titan II	GT-1	ETR 19	First Project Gemini flight, which tested the Titan II launch vehicle, Gemini spacecraft structural integrity, and spacecraft-launch vehicle compatibility. Spacecraft placed into orbit of 204 mile apogee, 99.6 mile perigee and 89.27 minute period. No separation between the 7,000 pound spacecraft and the spent rocket casing was planned; orbiting assembly re-entered the atmosphere and disintegrated about 3½ days later. Test objectives achieved. (S)
Gemini II	19 Jan 65	Gemini-Titan II	GT-2	ETR 19	Space Vehicle Development. Suborbital, unmanned re-entry test at maximum heating rate; demonstrated structural integrity and systems performance of the spacecraft throughout the flight, re-entry and parachute water landing. Recovery in down range Atlantic. (S)
GEMINI (MANNED)					
Gemini III	23 Mar 65	Gemini-Titan II	GT-3	ETR 19	First manned Gemini. Virgil Grissom, command pilot, and John W. Young, pilot. Three orbits, 4 hours and 53 minutes in space. First use of Orbital Attitude Maneuver System. First control of re-entry flight path using variable spacecraft. Spacecraft unofficially called 'Molly Brown". (S)

PROJECT GEMINI (FLIGHTS AND TESTS)
(continued)

Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
Gemini IV	3 Jun 65	Gemini-Titan II	GT-4	ETR 19	James McDivitt, command pilot, Edward White, pilot. 62 orbits, a total of 97 hours and 59 minutes in space. First extravehicular activities (EVA) for 22 minutes, and the first use of personal propulsion unit (both by White). A program of eleven scientific experiments was successfully conducted, rendezvous with booster not achieved due to excess fuel consumption. First mission controlled from MSC. Recovery by USS Wasp. (S)
Gemini V	21 Aug 65	Gemini-Titan II	GT-5	ETR 19	L. Gordon Cooper, command pilot, Charles Conrad, pilot. 120 revolutions, a total of 190 hours, 56 minutes in space. (8 days) Demonstrated physiological feasibility of lunar mission; evaluated spacecraft performance. Successfully simulated rendezvous and 16 of 17 experiments were performed. First use of the fuel cell. Recovery by the carrier, Lake Champlain. (S)
Gemini VI (Target Vehicle)	25 Oct 65	Atlas-Agena	GATV	ETR 14	Agena stage target vehicle for Gemini VI rendezvous disintegrated at time of ignition of main Agena engine; did not orbit. Caused postponement of Gemini VI, which was later rescheduled to rendezvous with Gemini VII. (U)

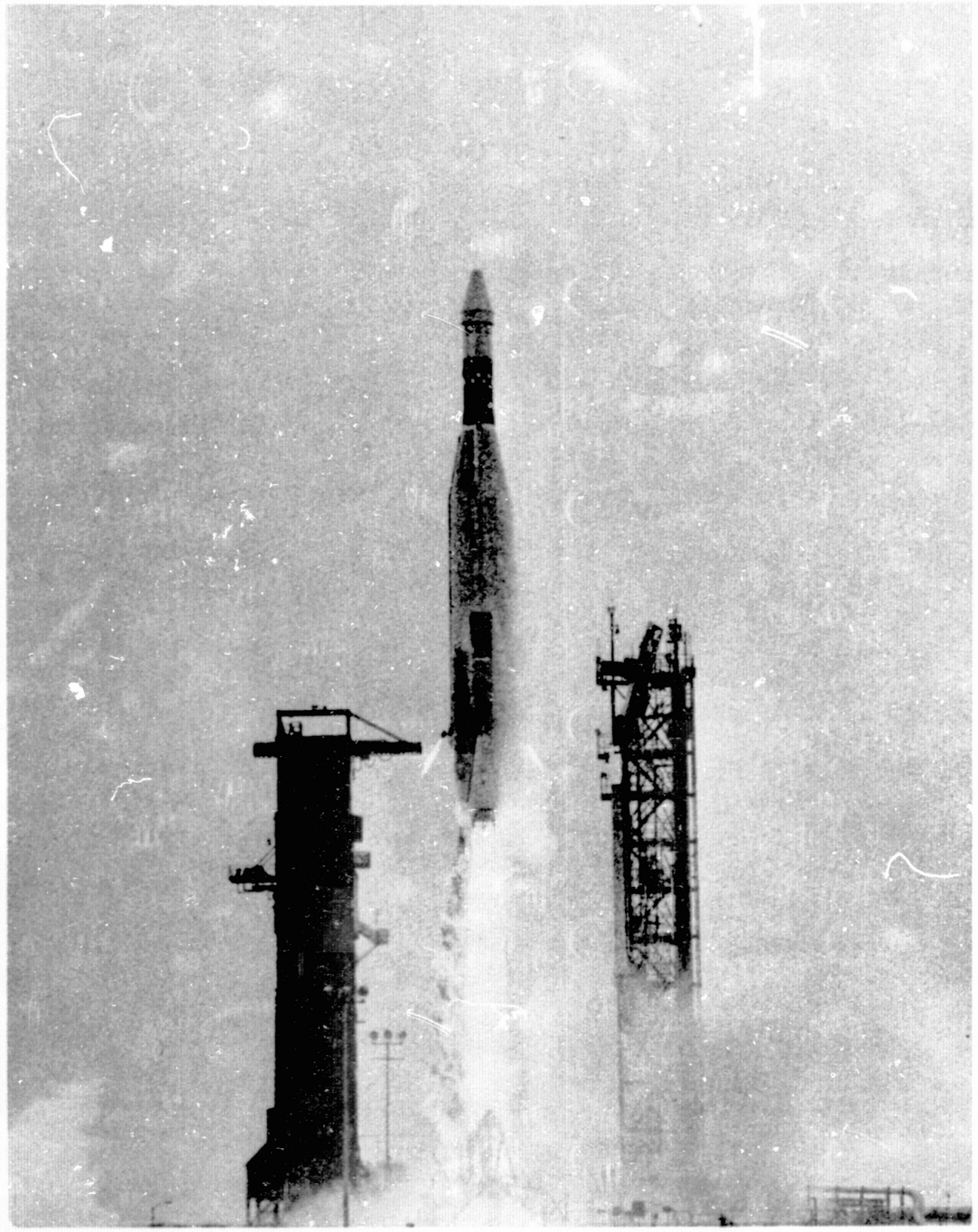
PROJECT GEMINI (FLIGHTS AND TESTS)
(continued)

Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
Gemini VII	4 Dec 65	Gemini-Titan II	GT-7	ETR 19	Frank Borman, command pilot, and James Lovell, pilot. 206 revolutions, 330 hours and 35 minutes in space, the longest duration to date. The first U.S. space flight in which part of the flight was made without space suit. Used as a rendezvous vehicle for GT-6, the two coming within one foot. Landed on December 18th, 17 miles from the USS Wasp. (S)
Gemini VI	15 Dec 65	Gemini-Titan II	GT-6	ETR 19	Walter Schirra, command pilot, Thomas Stafford, pilot. Conducted world's first rendezvous, using Gemini VII, for 5 hours, 19 minutes, approaching as near as one foot; re-entered December 16th after 25 hours, 51 minutes. Landed within 12 miles of the USS Wasp. (S)
Gemini VIII (Target Vehicle)	16 Mar 66	Atlas-Agena	GATV	ETR 14	Target vehicle available for passive rendezvous. Used as a rendezvous vehicle for Gemini VIII. Re-entered atmosphere September 15, 1967. (P)



ATLAS-AGENA 16 MARCH 1966 GEMINI AGENA TARGET VEHICLE

Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
Gemini VIII	16 Mar 66	Gemini-Titan II	GT-8	ETR 19	Neil Armstrong, Command Pilot, and David Scott, Pilot. 7 revolutions, 10 hours and 42 minutes in space. First dual launch and docking with the Agena target vehicle. Mission curtailed by short circuit in the Orbital Attitude Maneuvering System depleting fuel through thruster #8. Unexpected yaw and roll motion caused astronauts to undock, use their re-entry control system to stabilize the spacecraft, and re-enter on the 7th revolution instead of going the planned 44. Landing was in stipulated emergency area in the Western Pacific, 3 miles from USS Mason. EVA for one orbit not achieved. (P)
Gemini IX (Target Vehicle)	17 May 66	Atlas-Agena	GATV	ETR 14	Target vehicle for GT-9. The number two Atlas engine malfunctioned, the number one engine was unable to compensate for the pitch down attitude and the missile fell into the Atlantic. (U)
Gemini IX (Augmented Target Docking Adapter Vehicle)	1 Jun 66	Atlas	ATDA	ETR 14	Sent up in lieu of the unsuccessful GATV for GT-9. The ATDA was to be used for rendezvous and docking maneuvers. However, due to the faulty installation of separation devices, the protective shroud failed to separate from the satellite. Rendezvous later accomplished with the shroud still in place. Re-entered atmosphere June 11, 1966. (P)



ATLAS 1 JUNE 1966 AUGMENTED TARGET ADAPTER VEHICLE

PROJECT GEMINI (FLIGHTS AND TESTS)
(continued)

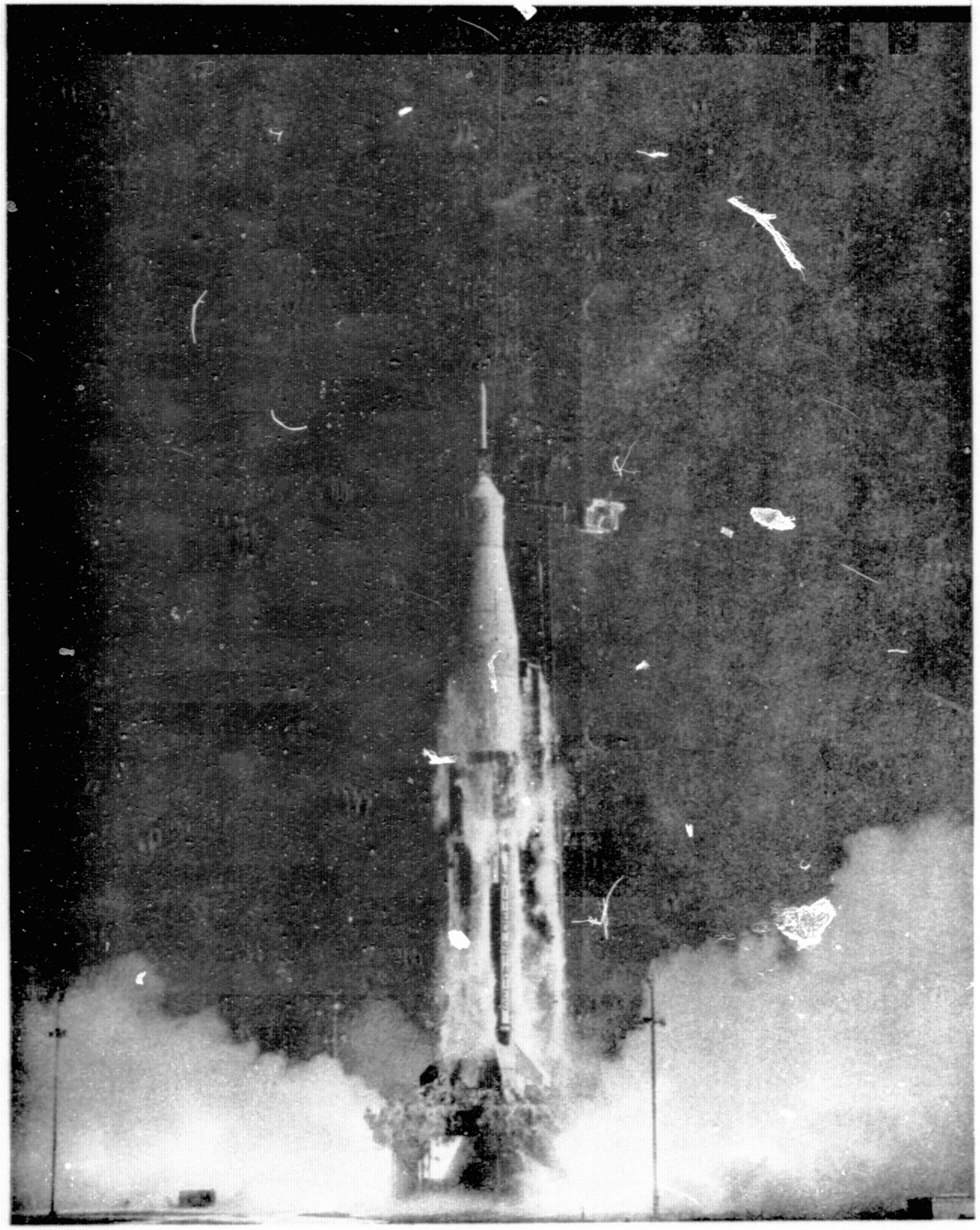
Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
Gemini IX	3 Jun 66	Gemini-Titan II	GT-9	ETR 19	Thomas Stafford, command pilot, and Eugene Cernan, pilot, were in orbit for 44 revolutions. The primary purpose was to rendezvous and dock with the GATV and to evaluate EVA. The ATDA, sent up in place of the unsuccessful GATV, kept its protective shroud, making docking impossible, although rendezvous was accomplished. Splash down on June 6th, 600 miles from Cape Kennedy, 31 miles from the USS Wasp. (P)
Gemini X (Target Vehicle)	18 Jul 66	Atlas-Agena	GATV	ETR 14	Rendezvous vehicle for GT-10. Launched 100 minutes before launch of GT-10. Placed in near circular orbit of 184 miles. Re-entered atmosphere December 29, 1966. (S)
Gemini X	18 Jul 66	Gemini-Titan II	GT-10	ETR 19	John Young, command pilot, with Michael Collins, pilot. Primary purpose was to rendezvous and dock with Agena test vehicle. Secondary objectives included rendezvous with the GT-7 target vehicle. More fuel used in docking than was planned. Docking accomplished on fourth revolution. Mated spacecraft reached apogee of 476 miles, later rendezvoused with GATV of GT-8. Stand-up EVA by Collins terminated due to irritation in eyes. Umbilical EVA terminated to save fuel. Re-entered on July 21 after 43 revolutions. (S)

PROJECT GEMINI (FLIGHTS AND TESTS)
(continued)

Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
Gemini XI (Target Vehicle)	12 Sep 66	Atlas-Agena	GATV	ETR 14	Launched 97 minutes before GT-11. Near circular orbit of 185 miles. Docking vehicle for GT-11. Re-entered atmosphere December 30, 1966. (S)
Gemini XI	12 Sep 66	Gemini-Titan II	GT-11	ETR 19	Charles Conrad, command pilot, Richard Gordon, pilot. Achieved main goal of rendezvous on first revolution. Four practice dockings accomplished. Gordon's planned 105 minute EVA cut short after 44 minutes when prescribed tasks caused perspiration to blind his eyes. Mated spacecraft attained an apogee of 851 miles. Gordon took 2 hour, 8 minute stand-up EVA, conducting photographic experiments. GATV and GT-11 tethered by rope. Re-entry on September 15 after 71 hours, 17 minutes, 44 revolutions. Landed 2 miles from target, picked up by USS Guam. (S)
Gemini XII (Target Vehicle)	11 Nov 66	Atlas-Agena	GATV	ETR 14	Target vehicle launched 98 minutes before GT-12. Went into a 158-169 mile orbit. Trouble with propulsion system caused cancellation of plans to raise spacecraft (mated) apogee to 530 miles. Re-entered atmosphere December 23, 1966. (S)

PROJECT GEMINI (FLIGHTS AND TESTS)
(continued)

Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
Gemini XII	11 Nov 66	Gemini-Titan II	GT-12	ETR 19	Manned orbital flight, with James Lovell as command pilot and Edward Aldrin as pilot. Rendezvous and docking with GATV completed on third revolution. Photos taken of total solar eclipse on November 12. Two stand-up EVA's for 208 minutes and 129 minutes of umbilical EVA. None of the former problems with EVA arose. Undocking and tether experiments carried out. Mission successfully ended after 94 hours, 35 minutes, and 59 revolutions. Landed 3 miles off target, picked up by USS Wasp in the Atlantic. Last Gemini flight. (S)



PROJECT APOLLO (FLIGHTS AND TESTS)

Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
SUBORBITAL (UNMANNED)					
Apollo 1	26 Feb 66	Saturn IB	AS-201 (CM/SM-009)	ETR 34	First officially designated Apollo mission. First launch of two stage Saturn IB (SA-201) and Apollo spacecraft (009). Unmanned suborbital flight to qualify launch vehicle, spacecraft command module (CM) heat-shielding and service module (SM) systems. Liftoff at 11:12 AM EST was normal and powered flight was as programmed. After separation from the launch vehicle, spacecraft reached 310 mile altitude. During descent SM reaction-control system rockets were fired once and main engine was fired twice, to increase spacecraft's re-entry speed. SM was jettisoned and CM re-entered atmosphere at 27,500 feet per second reaching a re-entry heat of about 4000° F. CM was recovered in good condition from South Atlantic near Ascension Island by helicopter from USS Boxer after 39 minute flight. (S)

NOTE

The Saturn IB launch vehicle was renamed the Uprated Saturn I on June 9, 1966. On January 15, 1968, the name was changed back to Saturn IB. Consequently, the Apollo 1 mission was launched by a Saturn IB, Apollo 2 and 3 were both launched by an Uprated Saturn I, and Apollo 5 was launched by a Saturn IB; all four launch vehicles were of the same type.

PROJECT APOLLO (FLIGHTS AND TESTS)
(continued)

Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
ORBITAL (UNMANNED)					
Apollo 2	5 Jul 66	Uprated Saturn I	AS-203	ETR 37B	Unmanned flight to test launch vehicle second (S-IVB) stage and instrument (IU), which reflected Saturn V configuration. 58,500 lb. payload consisting of S-IVB, IU and a nosecone (heaviest satellite orbited by U.S.) was injected into 117 mile circular orbit. S-IVB engine burned during launch phase, then shutdown. Capability of engine to restart in space demonstrated in theory. TV photos of liquid hydrogen fuel behavior in space transmitted to ground stations by camera within tank. Stage exploded on fourth orbit during test of common bulkhead when differential pressure in tanks rose well above design values. Pieces re-entered atmosphere between July 5 and July 22, 1966. (S)

Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
SUBORBITAL (UNMANNED)					
Apollo 3	25 Aug 66	Uprated Saturn I	AS-202 (CM/SM-011)	ETR 34	Second flight test of major spacecraft systems and second performance check of command module (CM) heatshielding; first use of spacecraft fuel cell power system. Liftoff at 1:16 PM EDT was normal. Launch vehicle (SA-202) developed 1,600,000 lb. thrust during first (S-IB) stage powered flight. After separation of Apollo spacecraft (011), service module (SM) engine was burned once to raise spacecraft to 706 mile altitude, then was ignited and cut off three more times to test rapid restart capability. CM separated from SM and re-entered atmosphere at more than 19,900 mph. Maximum re-entry temperature of CM's outer surface was calculated to be about 2700° F; interior temperature was 70° F. CM landed in Pacific 500 miles southwest of Wake Island after 93 minute flight and was recovered by USS Hornet. (S)

NOTE

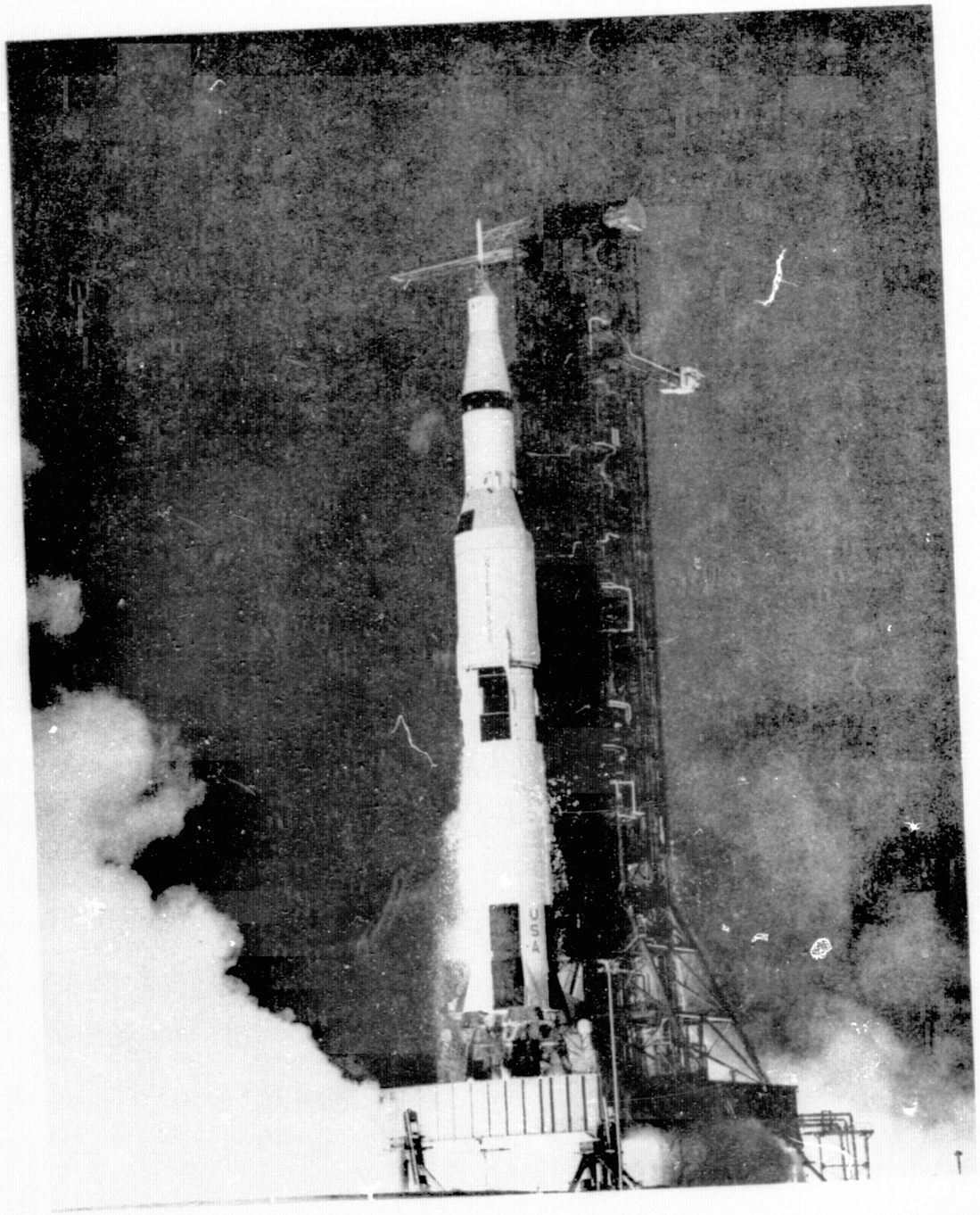
Following a review of the results of the Apollo 1, 2 and 3 missions, the Saturn IB launch vehicle and the Apollo spacecraft (command and service modules) were deemed qualified for Earth-orbital manned missions and preparations began for the first manned Apollo flight. At 6:31 PM EST on January 27, 1967, during a pre-launch test on Launch Complex 34 with the crew onboard and the spacecraft's 100% oxygen atmosphere pressurized to 16.7 pounds psia, fire broke out in the command module resulting in the deaths of astronauts Virgil I. (Gus) Grissom, Edward H. White II, and Roger B. Chaffee.

PROJECT APOLLO (FLIGHTS AND TESTS)
(continued)

Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
ORBITAL (UNMANNED)					
Apollo 4	9 Nov 67	Saturn V	AS-501	ETR (KSC) 39A	First launch from mobile launch facilities (LC-39) at Kennedy Space Center. First launch of Saturn V. First "all-up" test of a launch vehicle (in which all stages were live and were fired on a maiden flight). All 3 stages of the Saturn V successfully fired, injecting the 3rd (S-IVB) stage and Apollo spacecraft into a 115 statute mile parking orbit. After 2 revolutions, the S-IVB stage was reignited, injecting the stage and spacecraft into an Earth-intersecting orbit with an apogee of 10,696 statute miles. Following stage/spacecraft separation, the spacecraft service propulsion system (SPS) was ignited for a short-duration burn, raising the Apollo command and service module (CSM) to a 11,232 statute mile apogee. The CSM was then aligned to achieve a thermal gradient across the command module (CM) heatshield (with the CM hatch window directly toward the Sun) and held in this attitude for about 4½ hours. The SPS was then reignited for a long-duration burn, accelerating the spacecraft to simulate the most severe combination of entry conditions of a lunar return trajectory. The CM and service module (SM) then separated, and the Apollo CM was oriented to entry attitude. Atmospheric entry occurred at 400,000 feet, at a flight path angle of -7^{o}, and a velocity of 36,537 feet per second. CM landing occurred in the Pacific within 10 statute miles of the planned point, 8 hours, 37 minutes after liftoff. The CM, apex cover, and one of the 3 main parachutes were recovered. All primary mission objectives were successfully accomplished. (S)

PROJECT APOLLO (FLIGHTS AND TESTS)
(continued)

Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
Apollo 5	22 Jan 68	Saturn IB	AS-204/ LM-1	ETR 37B	First Earth-orbital test (unmanned) of Apollo spacecraft Lunar Module (LM). (On this flight Apollo Command and Service Modules were replaced by a dummy nosecone.) Launched at 1748 EST after extended holds caused by spacecraft equipment and ground instrumentation problems. LM and second (S-IVB) stage of Saturn IB successfully injected into desired orbit, then separated. Although LM descent stage propulsion system did not sustain combustion following first ignition, later attempts were successful (including restart). LM ascent stage propulsion system operation and staging of ascent and descent stages were also performed successfully. All mission objectives were achieved. S-IVB stage re-entered Earth's atmosphere on January 23, LM ascent stage re-entered on January 24, and descent stage re-entered on February 12, 1968. No attempts at recovery were planned, or made. (S)



SATURN V | 4 APRIL 1968 | APOLLO 6

PROJECT APOLLO (FLIGHTS AND TESTS)
(continued)

Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
Apollo 6	4 Apr 68	Saturn V (AS-502)	AS-502/ CSM-020	ETR (KSC) 39A	Planned as a mission similar to Apollo 4 (November 9, 1967), but in-flight problems prevented achievement of primary mission objectives. Liftoff was normal and on schedule at 0700 EST. However, severe up-and-down vibrations of the entire space vehicle (POGO) during first (S-IC) stage thrust, early shutdown of two second (S-II) stage engines, and failure of the third (S-IVB) stage engine to restart following orbital coast, required that Mission Control perform an alternate mission. Spacecraft separation was commanded, and the Service Module (SM) engine was started and burned for 445 seconds to raise spacecraft apogee to 12,000 miles, utilizing most of the propellants and resulting in Command Module (CM) reentry 4,000 feet per second less than planned. CM was recovered in Pacific near Hawaii, about 200 nm from the target area, 9 hours, 58 minutes after liftoff. (U)

PROJECT APOLLO (FLIGHTS AND TESTS)
(continued)

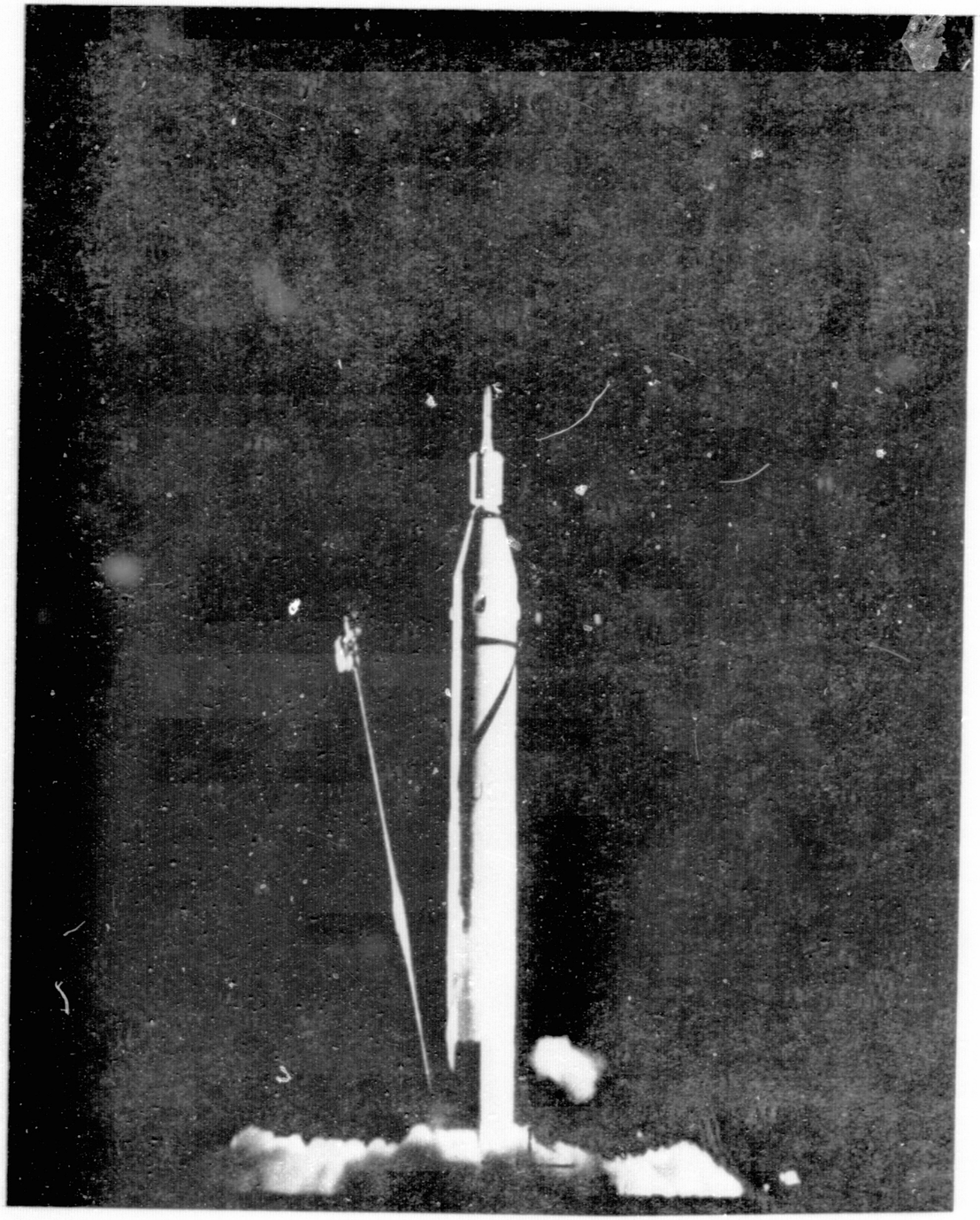
Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
Test and Training Satellite	13 Dec 67	Delta	TTS-1	ETR 17B	Launched as a piggy-back payload attached to rear of second stage of Delta vehicle that successfully injected Pioneer VIII into solar orbit. Timer aboard Delta second stage ejected TTS one minute after third stage ignition. Forty-pound, eight-sided (14 inches/side) satellite with solar cells on external surfaces. Contains a power supply, command receiver, telemetry transmitter, passive magnetic stabilization system, and a transponder compatible with unified S-Band (USB) system. Transponder is designed to transmit and receive S-Band data characteristics of the Apollo spacecraft and its mission. During anticipated 3 month lifetime, satellite will afford each shift of every Manned Space Flight Network (MSFN) station ample opportunities to checkout equipment and train personnel. 300 statute mile apogee; 182 statute mile perigee; 33 degree inclination; 92 minute period. Re-entered atmosphere April 28, 1968. (S)

KSC HISTORICAL REPORT
APPENDIX A

SUMMARY OF LAUNCHINGS PRIOR TO OCTOBER 1958 BY SPACE PROJECTS LATER TRANSFERRED TO NASA

On October 1, 1958, coincidental with the official activation of the National Aeronautics and Space Administration, President Eisenhower issued Executive Order 10783. This order transferred jurisdiction to NASA from the Department of Defense's Advanced Research Projects Agency of several space programs that were already well under way. Included among these were: the Naval Research Laboratory's International Geophysical Year satellite program (Vanguard), initiated September 9, 1955; the Army Ballistic Missile Agency's satellite launching project (Explorer), authorized to proceed on November 8, 1957; certain lunar probes under the direction of the Air Force Ballistic Missile Division (forerunner of the Pioneer space probes), officially announced on March 27, 1958.

This Appendix lists the launching attempts in these programs that occurred prior to October 1, 1958. Launching attempts made subsequent to October 1, 1958, as a part of these and other space programs transferred to NASA by Executive Order 10783, are contained in the main portion of this report.



JUNO I (JUPITER C) **31 JANUARY 1958** **EXPLORER I**

SUMMARY OF LAUNCHINGS PRIOR TO OCTOBER 1958 BY SPACE PROJECTS LATER TRANSFERRED TO NASA
(All launchings were from Cape Canaveral)

Name	Date	Launch Vehicle	Intntl. Desig.	Pad	Remarks/Results
EXPLORER					
Explorer I	31 Jan 58	Juno I (Jupiter C) RTV-4	1958 Alpha	5	Explorer I, the first American satellite, was successfully launched into an orbit with an apogee of 1,573 miles and a perigee of 224 miles. The satellite, 80 inches long and 6 inches in diameter, was an integral part of the launch vehicle's fourth stage motor case, and weighed 30.8 pounds. Its payload, weighing 18.13 pounds (including two radio transmitters and their mercury batteries), was developed by Iowa State University under the direction of James A. Van Allen and contained instruments to measure cosmic rays, micrometeor impact, and internal and external temperatures. Analysis of data returned by Explorer I resulted in the discovery of belts of radiation surrounding the Earth (the Van Allen belts). The satellite transmitted data until May 23, 1958 and is still in orbit. The Juno I launch vehicle, developed by the Army Ballistic Missile Agency with the assistance of the Jet Propulsion Laboratory, consisted of a three stage Jupiter C Composite Re-entry Test Vehicle modified by the addition of a live, solid propellant fourth stage. (Of the six Juno I's constructed, three successfully orbited satellites.) (S)

SUMMARY OF LAUNCHINGS PRIOR TO OCTOBER 1958 BY SPACE PROJECTS LATER TRANSFERRED TO NASA
(All launchings were from Cape Canaveral)
(continued)

Name	Date	Launch Vehicle	Intntl. Desig.	Pad	Remarks/Results
Explorer II	5 Mar 58	Juno I (Jupiter C) RTV-5	--	5	An attempt to orbit the Explorer II satellite was unsuccessful when the fourth stage of the Juno I launch vehicle failed to ignite, resulting in insufficient speed to attain orbital velocity. The satellite probably burned up on re-entering the atmosphere, before falling into the Atlantic near Trinidad, 1,900 miles from the launching site. (U)
Explorer III	26 Mar 58	Juno I (Jupiter C) RTV-6	1958 Gamma	5	Explorer III, the third U.S. IGY satellite, was successfully launched into an orbit with an apogee of 1,746 miles and a perigee of 121 miles. The satellite instrumentation was similar to that of Explorer I, with the addition of a tape recorder feature. On May 1, 1958, Dr. James A. Van Allen announced that scientific findings from Explorers I and III disclosed an unexpected band of high-intensity radiation extending from 600 miles above Earth to possibly an 8,000 mile altitude. The Explorers also showed that the atmosphere at 220 miles was denser than predicted, that satellite temperatures would not be too great for humans, and that cosmic dust was only a small hazard to space travel. Explorer III transmitted data until June 16, 1958 and re-entered the atmosphere June 28, 1958. (S)

SUMMARY OF LAUNCHINGS PRIOR TO OCTOBER 1958 BY SPACE PROJECTS LATER TRANSFERRED TO NASA
(All launchings were from Cape Canaveral)
(continued)

Name	Date	Launch Vehicle	Intntl. Desig.	Pad	Remarks/Results
Explorer IV	26 Jul 58	Juno 1 (Jupiter C) RTV-7	1958 Epsilon	5	The fourth U.S. IGY satellite was successfully launched by a Juno I into an orbit with an apogee of 1,380 miles and a perigee of 163 miles. Instrumentation was designed to measure corpuscular radiation and consisted of two Geiger-Mueller counters and two scintillator counters. Two radios, powered by mercury batteries, transmitted information simultaneously and continuously, utilizing the satellite's stainless steel skin as antennas. Explorer IV transmitted data until October 6, 1958 and re-entered the atmosphere on October 23, 1959. (S)
Explorer V	24 Aug 58	Juno I (Jupiter C) RTV-8	--	5	The fifth orbital attempt by the Army Ballistic Missile Agency, using the Juno I launch vehicle, was unsuccessful. Lift-off was normal, but after separation of the first stage, its residual fuel carried it forward to bump and deflect from course the remaining three stages. They fired normally, but failed to carry the satellite into orbit. The flight lasted 659 seconds, on a parth northeast from Cape Canaveral. The satellite carried instrumentation designed to measure the Van Allen radiation belt. (U)

SUMMARY OF LAUNCHINGS PRIOR TO OCTOBER 1958 BY SPACE PROJECTS LATER TRANSFERRED TO NASA
(All launchings were from Cape Canaveral)
(continued)

Name	Date	Launch Vehicle	Intntl. Desig.	Pad	Remarks/Results
VANGUARD					
Vanguard Test Vehicle	6 Dec 57	Vanguard TV-3	--	18A	The first attempt by the Naval Research Laboratory (NRL) to orbit a test satellite using a Vanguard rocket with all three stages powered was unsuccessful when a mechanical failure in the propulsion system caused it to burst into flames two seconds after it was fired, after lifting about six inches off the pad. (Previous Vanguard project launchings at Cape Canaveral were launch vehicle development tests, not orbital attempts.) (U)
Vanguard Test Vehicle (Backup)	5 Feb 58	Vanguard TV-3BU	--	18A	The second trial firing of a Vanguard test satellite failed as defects in the first stage engine control system caused the rocket to veer to the right and break into about 60 seconds after launching, 4 miles up. The rocket was destroyed by the range safety officer. (U)

SUMMARY OF LAUNCHINGS PRIOR TO OCTOBER 1958 BY SPACE PROJECTS LATER TRANSFERRED TO NASA
(All launchings were from Cape Canaveral)
(continued)

Name	Date	Launch Vehicle	Intntl. Desig.	Pad	Remarks/Results
Vanguard I	17 Mar 58	Vanguard TV-4	1958 Beta 1 (Casing) 1958 Beta 2 (Satellite)	18A	Vanguard I, the second U.S. Satellite, an aluminum test sphere 6.4 inches in diameter and weighing 3.25 pounds, was successfully launched into orbit, together with its 50-pound carrier rocket casing, just "two years, six months and eight days after initiation of the project from scratch", as pointed out by John P. Hagen, NRL program director. Initial perigee was 409 miles, and apogee was 2453 miles, at an inclination to the equator of 34.26 degrees. Geodetic observations of its stable orbit determined that Earth is slightly pear-shaped. Although not actually instrumented, two transmitters were carried and temperatures could be deduced from changes in their radio frequencies. Satellite transmitted data until May 1964 and is still in orbit. (S)
Vanguard Test Vehicle	28 Apr 58	Vanguard TV-5	--	18A	Attempt to orbit an instrumented satellite 20 inches in diameter and weighing 21.5-pounds, using a Vanguard test vehicle. Satellite instruments were intended to record X-rays, temperatures, and meteor data. Failure of the third stage engine to ignite due to faulty wiring in the ignition circuit resulted in the launch vehicle being unable to attain orbital speed. Satellite burned up on re-entry; launch vehicle impacted 1,500 miles down range. (U)

SUMMARY OF LAUNCHINGS PRIOR TO OCTOBER 1958 BY SPACE PROJECTS LATER TRANSFERRED TO NASA
(All launchings were from Cape Canaveral)
(continued)

Name	Date	Launch Vehicle	Intntl. Desig.	Pad	Remarks/Results
Vanguard Satellite Launch Vehicle	27 May 58	Vanguard SLV-1	--	18A	First attempt to orbit an instrumented satellite using a nontest, operational Vanguard launch vehicle. Satellite instruments included meteor detectors, solar radiation measurers, and thermometers. Liftoff was normal, and all vehicle stages fired. However, improper burnout of second stage resulted in too steep a climb angle and failure to achieve orbit. Reached an altitude of 2,440 miles and burned up on re-entry between Antigua and Africa, 5,000 miles away. Satellite radio returned some data. (U)
Vanguard Satellite Launch Vehicle	26 Jun 58	Vanguard SLV-2	--	18A	Second orbital attempt using a production Vanguard launch vehicle. Satellite instrumentation was the same as for April 28 attempt. Liftoff was normal, but second stage engine cut off prematurely due to low thrust chamber pressure. Launch vehicle demonstrated structural integrity when tankage withstood pressures exceeding design values.

SUMMARY OF LAUNCHINGS PRIOR TO OCTOBER 1958 BY SPACE PROJECTS LATER TRANSFERRED TO NASA
(All launchings were from Cape Canaveral)
(continued)

Name	Date	Launch Vehicle	Intntl. Desig.	Pad	Remarks/Results
Vanguard Satellite Launch Vehicle	26 Sep 58	Vanguard SLV-3	--	18A	Following an abortive attempt on September 17, in which the vehicle lifted about one inch off the launch pedestal, then settled back into position when uneven release of ground-disconnect plugs transmitted a spurious shutdown signal to the first stage engine, Vanguard SLV-3 was launched on this date. Liftoff was normal, and all stages fired. However, second stage low performance, possibly due to corrosive particles partially clogging fuel tank piping, resulted in the satellite not attaining sufficient speed to maintain an orbit. Although not verified by tracking data, the satellite may have made at least one complete orbit at an altitude of 265 miles before falling into the Indian Ocean, approximately 9,200 miles from the launching site. The satellite contained instruments to measure cloud cover, and carried a tape recorder to store data for a later release on command from a ground station. (U)

SUMMARY OF LAUNCHINGS PRIOR TO OCTOBER 1958 BY SPACE PROJECTS LATER TRANSFERRED TO NASA
(All launchings were from Cape Canaveral)
(continued)

Name	Date	Launch Vehicle	Intntl. Desig.	Pad	Remarks/Results
PIONEER					
Pioneer	17 Aug 58	Thor-Able-1	--	17A	The first attempt by the Air Force Ballistic Missile Division to launch a lunar probe, using the three stage Thor-Able launch vehicle, was unsuccessful, due to a failure in the first stage engine. Liftoff was normal, but an explosion ripped the vehicle apart after 77 seconds of flight, at an altitude of about 10 miles. The mission had been designed to put 40 pounds of instruments in an orbit around the Moon, to take pictures of the backside. In addition to the scanning devices, the probe contained a magnetometer, a meteorite counter, and thermometers. Had the mission been successful, the probe would have been given the designation of Pioneer. (U)

KSC HISTORICAL REPORT
APPENDIX B

CHRONOLOGICAL LISTING OF MAJOR NASA LAUNCHINGS (ETR)

This chronological listing is designed to serve as a quick reference for those individuals who want to know the number of NASA launchings from the ETR in any particular year or combination of years. Although this information can be obtained from the Summary itself, it would be necessary to compile it by referring to the various Program sections of the document.

APPENDIX B

CHRONOLOGICAL LISTING OF MAJOR NASA LAUNCHINGS (ETR)

YEAR	NAME	LAUNCH VEHICLE
1958 (4)		
October 11	Pioneer I	Thor-Able
October 22	Beacon	Jupiter C
November 8	Pioneer II	Thor-Able
December 6	Pioneer III	JUNO II
1959 (11)		
February 17	Vanguard II	Vanguard SLV-4
March 3	Pioneer IV	Juno II
April 13	Vanguard	Vanguard SLV-5
June 22	Vanguard	Vanguard SLV-6
July 16	Explorer	Juno II
August 7	Explorer VI	Thor-Able
August 14	Beacon	Juno II
September 9	Big Joe	Atlas-Big Joe
September 18	Vanguard III	Vanguard SLV-7
October 13	Explorer VII	Juno II
November 26	Pioneer	Atlas-Able

CHRONOLOGICAL LISTING OF MAJOR NASA LAUNCHINGS (ETR)
(continued)

YEAR	NAME	LAUNCH VEHICLE
1960 (12)		
March 11	Pioneer V	Thor-Able
March 23	Explorer	Juno II
April 1	Tiros I	Thor-Able
May 13	Echo	Delta
July 29	Mercury	Mercury-Atlas
August 12	Echo I	Delta
September 25	Pioneer	Atlas-Able
November 3	Explorer VIII	Juno II
November 21	Mercury	Mercury-Redstone
November 23	Tiros II	Delta
December 15	Pioneer	Atlas-Able
December 19	Mercury	Mercury-Redstone

CHRONOLOGICAL LISTING OF MAJOR NASA LAUNCHINGS (ETR)
(continued)

YEAR	NAME	LAUNCH VEHICLE
1961 (18)		
January 31	Mercury	Mercury-Redstone
February 21	Mercury	Mercury-Atlas
February 24	Explorer	Juno II
March 24	Mercury	Mercury-Redstone
March 25	Explorer X	Delta
April 25	Mercury	Mercury-Atlas
April 27	Explorer XI	Juno II
May 5	Freedom 7 (Shepard)	Mercury Redstone
May 24	Explorer	Juno II
July 12	Tiros III	Delta
July 21	Liberty Bell (Grissom)	Mercury-Redstone
August 15	Explorer XII	Delta
August 23	Ranger I	Atlas-Agena
September 13	Mercury	Mercury-Atlas
October 27	Saturn (SA-1)	Saturn C-1
November 1	Mercury	Mercury-Scout
November 18	Ranger II	Atlas-Agena
November 29	Mercury	Mercury-Atlas

CHRONOLOGICAL LISTING OF MAJOR NASA LAUNCHINGS (ETR)
(continued)

YEAR	NAME	LAUNCH VEHICLE
1962 (22)		
January 15	Echo (Suborbital)	Thor
January 26	Ranger III	Atlas-Agena
February 8	Tiros IV	Delta
February 20	Friendship 7 (Glenn)	Mercury-Atlas
March 7	OSO I	Delta
April 23	Ranger IV	Atlas-Agena
April 25	Saturn (SA-2)	Saturn C-1
April 26	Ariel I	Delta
May 8	Centaur	Atlas-Centaur
May 24	Aurora 7 (Carpenter)	Mercury-Atlas
June 19	Tiros V	Delta
July 10	Telstar I	Delta
July 18	Echo (Suborbital)	Thor
July 22	Mariner I	Atlas-Agena
August 27	Mariner II	Atlas-Agena
September 18	Tiros VI	Delta
October 2	Explorer XIV	Delta

CHRONOLOGICAL LISTING OF MAJOR NASA LAUNCHINGS (ETR)
(continued)

YEAR	NAME	LAUNCH VEHICLE
1962 (continued)		
October 3	Sigma 7 (Schirra)	Mercury-Atlas
October 18	Ranger V	Atlas-Agena
October 27	Explorer XV	Delta
November 16	Saturn (SA-3)	Saturn C-1
December 13	Relay I	Delta
1963 (10)		
February 14	Syncom I	Delta
March 28	Saturn (SA-4)	Saturn 1
April 2	Explorer XVII	Delta
May 7	Telstar II	Delta
May 15	Faith 7 (Cooper)	Mercury-Atlas
June 19	Tiros VII	Delta
July 26	Syncom II	Delta
November 26	Explorer XVIII	Delta
November 27	Centaur	Atlas-Centaur
December 21	Tiros VIII	Delta

CHRONOLOGICAL LISTING OF MAJOR NASA LAUNCHINGS (ETR)
(continued)

YEAR	NAME	LAUNCH VEHICLE
1964 (17)		
January 21	Relay II	Delta
January 29	Saturn (SA-5)	Saturn 1
January 30	Ranger VI	Atlas-Agena
March 19	Beacon-Explorer A	Delta
April 8	Gemini 1	Gemini-Titan II
April 14	Fire I	Atlas D
May 28	Saturn (SA-6)	Saturn 1
June 30	Centaur	Atlas-Centaur
July 28	Ranger VII	Atlas-Agena
August 19	Syncom III	TAD (Thrust Augmented Delta)
September 4	OGO I	Atlas-Agena
September 18	Saturn (SA-7)	Saturn 1
October 3	Explorer XXI	Delta
November 5	Mariner III	Atlas-Agena
November 28	Mariner IV	Atlas-Agena
December 11	Centaur	Atlas-Centaur
December 21	Explorer XXVI	Delta

CHRONOLOGICAL LISTING OF MAJOR NASA LAUNCHINGS (ETR)
(continued)

YEAR	NAME	LAUNCH VEHICLE
1965 (23)		
January 19	Gemini 2	Gemini-Titan II
January 22	Tiros IX	Delta
February 3	OSO II	Delta
February 16	Saturn/Pegasus I (SA-9)	Saturn 1
February 17	Ranger VIII	Atlas-Agena
March 2	Centaur	Atlas-Centaur
March 21	Ranger IX	Atlas-Agena
March 23	Gemini 3 (Grissom and Young)	Gemini-Titan II
April 6	Intelsat I (Early Bird I)	TAD
May 22	Fire II	Atlas D
May 25	Saturn/Pegasus II (SA-8)	Saturn 1
May 29	Explorer XXVIII	Delta
June 3	Gemini 4 (McDivitt and White)	Gemini-Titan II
July 1	Tiros X	Delta
July 30	Saturn/Pegasus III (SA-10)	Saturn 1
August 11	Centaur	Atlas-Centaur
August 21	Gemini 5 (Cooper and Conrad)	Gemini-Titan II
August 25	OSO-C	Delta

CHRONOLOGICAL LISTING OF MAJOR NASA LAUNCHINGS (ETR)
(continued)

YEAR	NAME	LAUNCH VEHICLE
1965 (continued)		
October 25	Gemini Target Vehicle	Atlas-Agena
November 6	Explorer XXIX	TAD
December 4	Gemini 7 (Borman and Lovell)	Gemini-Titan II
December 15	Gemini 6 (Schirra and Stafford)	Gemini-Titan II
December 16	Pioneer VI	TAD
1966 (30)		
February 3	Essa I (TOS)	Delta
February 26	Apollo 1 (AS-201)	Saturn 1B
February 28	Essa II (TOS)	Delta
March 16	Gemini Target Vehicle	Atlas-Agena
March 16	Gemini 8 (Armstrong and Scott)	Gemini-Titan II
April 7	Centaur	Atlas-Centaur
April 8	OAO I	Atlas-Agena
May 17	Gemini Target Vehicle (failed)	Atlas-Agena
May 25	Explorer XXXII	Delta
May 30	Surveyor I	Atlas-Centaur
June 1	Gemini Target Vehicle (ATDA)	Atlas
June 3	Gemini 9 (Stafford and Cernan)	Gemini-Titan II

CHRONOLOGICAL LISTING OF MAJOR NASA LAUNCHINGS (ETR)
(continued)

YEAR	NAME	LAUNCH VEHICLE
1966 (continued)		
June 6	OGO III	Atlas-Agena
July 1	Explorer XXXIII	TAD
July 5	Apollo 2 (AS-203)	Uprated Saturn 1 (1B)
July 18	Gemini Target Vehicle	Atlas-Agena
July 18	Gemini 10 (Young and Collins)	Gemini-Titan II
August 10	Lunar Orbiter I	Atlas-Agena
August 17	Pioneer VII	TAD
August 25	Apollo 3 (AS-202)	Uprated Saturn 1
September 12	Gemini Target Vehicle	Atlas-Agena
September 12	Gemini 11 (Conrad and Gordon)	Gemini-Titan II
September 20	Surveyor	Atlas-Centaur
October 26	Intelsat II-A (Pacific)	TAD
October 26	Centaur	Atlas-Centaur
November 6	Lunar Orbiter II	Atlas-Agena
November 11	Gemini Target Vehicle	Atlas-Agena
November 11	Gemini 12 (Lovell and Aldrin)	Gemini-Titan II
December 6	ATS-1	Atlas-Agena
December 14	Biosatellite I	TAD

CHRONOLOGICAL LISTING OF MAJOR NASA LAUNCHINGS (ETR)
(continued)

YEAR	NAME	LAUNCH VEHICLE
1967 (19)		
January 11	Intelsat II-B (Pacific)	TAD
February 4	Lunar Orbiter III	Atlas-Agena
March 8	OSO III	Delta
March 22	Intelsat II (Atlantic)	TAD
April 5	ATS-II	Atlas-Agena
April 17	Surveyor III	Atlas-Centaur
May 4	Lunar Orbiter IV	Atlas-Agena
June 14	Mariner V	Atlas-Agena
July 14	Surveyor IV	Atlas-Centaur
July 19	Explorer XXXV	TAD
August 1	Lunar Orbiter V	Atlas-Agena
September 7	Biosatellite II	TAD
September 8	Surveyor V	Atlas-Centaur
September 27	Intelsat II (Pacific-2)	TAD
October 18	OSO IV	Delta
November 5	ATS-III	Atlas-Agena
November 7	Surveyor VI	Atlas-Centaur
November 9	Apollo 4 (AS-501)	Saturn V
December 13	Pioneer VIII and TTS-1	Delta

CHRONOLOGICAL LISTING OF MAJOR NASA LAUNCHINGS (ETR)
(continued)

YEAR	NAME	LAUNCH VEHICLE
1968 (6)		
January 7	Surveyor VII	Atlas-Centaur
January 22	Apollo 5 (AS-204)	Saturn IB
March 4	OGO V	Atlas-Agena
April 4	Apollo 6 (AS-502)	Saturn V
August 10	ATS-IV	Atlas-Centaur
September 18	Intelsat III	TAD

Total launchings, October 1, 1958 - September 30, 1968 - 172

GP 381
September 30, 1968
(Rev. January 27, 1969)

ERRATA SHEET

GP 381, "A Summary of Major NASA Launchings, Eastern Test Range and Western Test Range," dated September 30, 1968, was considered to be accurate as of the date of publication. However, additional research has brought to light new information on the official mission designations for Project Apollo. Therefore, in the interest of accuracy it was believed necessary to issue revised pages, rather than wait until the next complete revision of the publication to correct the errors. Holders of copies of this brochure are requested to remove and destroy the existing pages 81, 82, 83, and 84, and insert the attached revised pages 81, 82, 83, 84, 84A, and 84B in their place.

William A. Lockyer, Jr.

PROJECT APOLLO (FLIGHTS AND TESTS)

Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
SUBORBITAL (UNMANNED)					
	26 Feb 66	Saturn IB	AS-201 (CM/SM-009)	ETR 34	First officially designated Apollo mission. First launch of two stage Saturn IB (SA-201) and Apollo spacecraft (009). Unmanned suborbital flight to qualify launch vehicle, spacecraft command module (CM) heat-shielding and service module (SM) systems. Liftoff at 11:12 AM EST was normal and powered flight was as programmed. After separation from the launch vehicle, spacecraft reached 310 mile altitude. During descent SM reaction-control system rockets were fired once and main engine was fired twice, to increase spacecraft's re-entry speed. SM was jettisoned and CM re-entered atmosphere at 27,500 feet per second reaching a re-entry heat of about 4000°F. CM was recovered in good condition from South Atlantic near Ascension Island by helicopter from USS Boxer after 39 minute flight. (S)

NOTE

The Saturn IB launch vehicle was renamed the Uprated Saturn I on June 9, 1966. On January 15, 1968, the name was changed back to Saturn IB. Consequently, the AS-201 mission was launched by a Saturn IB, SA-203 and AS-202 were both launched by an Uprated Saturn I, and Apollo 5 was launched by a Saturn IB; all four launch vehicles were of the same type.

Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
ORBITAL (UNMANNED)					
	5 Jul 66	Uprated Saturn I	SA-203	ETR 37B	Unmanned flight to test launch vehicle second (S-IVB) stage and instrument (IU), which reflected Saturn V configuration. 58,500 lb. payload consisting of S-IVB, IU and a nosecone (heaviest satellite orbited by U.S.) was injected into 117 mile circular orbit. S-IVB engine burned during launch phase, then shutdown. Capability of engine to restart in space demonstrated in theory. TV photos of liquid hydrogen fuel behavior in space transmitted to ground stations by camera within tank. Stage exploded on fourth orbit during test of common bulkhead when differential pressure in tanks rose well above design values. Pieces re-entered atmosphere between July 5 and July 22, 1966. (S)

Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
SUBORBITAL (UNMANNED)					
	25 Aug 66	Uprated Saturn I	AS-202 (CM/SM-011)	ETR 34	Second flight test of major spacecraft systems and second performance check of command module (CM) heatshielding; first use of spacecraft fuel cell power system. Liftoff at 1:16 PM EDT was normal. Launch vehicle (SA-202) developed 1,600,000 lb. thrust during first (S-IB) stage powered flight. After separation of Apollo spacecraft (011), service module (SM) engine was burned once to raise spacecraft to 706 mile altitude, then was ignited and cut off three more times to test rapid restart capability. CM separated from SM and re-entered atmosphere at more than 19,900 mph. Maximum re-entry temperature of CM's outer surface was calculated to be about 2700°F; interior temperature was 70°F. CM landed in Pacific 500 miles southwest of Wake Island after 93 minute flight and was recovered by USS Hornet. (S)

PROJECT APOLLO (FLIGHTS AND TESTS)
(continued)

Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
ORBITAL (MANNED)					
Apollo 1	27 Jan 67	Uprated Saturn I	AS-204* (CM/SM-012)	ETR	Following a review of the results of the Apollo/Saturn missions, the Saturn IB launch vehicle and the Apollo spacecraft (command and service modules) were deemed qualified for Earth-orbital manned missions and preparations began for the first manned Apollo flight. At 6:31 PM EST on January 27, 1967, during a pre-launch test on Launch Complex 34 with the crew onboard and the spacecraft's 100% oxygen atmosphere pressurized to 16.7 pounds psia, fire broke out in the command module resulting in the deaths of astronauts Virgil I. (Gus) Grissom, Edward H. White II, and Roger B. Chaffee. Although not a launch, this test was officially designated as Apollo 1 on April 24, 1967, by Dr. George E. Mueller, Associate Administrator for Manned Space Flight, NASA. *The AS-204 launch vehicle assigned to this mission was later refurbished and utilized on the Apollo 5 mission.

Name	Date	Launch Vehicle	NASA Code	Site/Pad	Remarks/Results
ORBITAL (UNMANNED)					
Apollo 4	9 Nov 67	Saturn V	AS-501	ETR (KSC) 39A	First launch from mobile launch facilities (LC-39) at Kennedy Space Center. First launch of Saturn V. First "all-up" test of a launch vehicle (in which all stages were live and were fired on a maiden flight). All 3 stages of the Saturn V successfully fired, injecting the 3rd (S-IVB) stage and Apollo spacecraft into a 115 statute mile parking orbit. After 2 revolutions, the S-IVB stage was reignited, injecting the stage and spacecraft into an Earth-intersecting orbit with an apogee of 10,696 statute miles. Following stage/spacecraft separation, the spacecraft service propulsion system (SPS) was ignited for a short-duration burn, raising the Apollo command and service module (CSM) to a 11,232 statute mile apogee. The CSM was then aligned to achieve a thermal gradient across the command module (CM) heatshield (with the CM hatch window directly toward the Sun) and held in this attitude for about 4½ hours. The SPS was then reignited for a long-duration burn, accelerating the spacecraft to simulate the most severe combination of entry conditions of a lunar return trajectory. The CM and service module (SM) then separated, and the Apollo CM was oriented to entry attitude. Atmospheric entry occurred at 400,000 feet, at a flight path angle of -7°, and a velocity of 36,537 feet per second. CM landing occurred in the Pacific within 10 statute miles of the planned point, 8 hours, 37 minutes after liftoff. The CM, apex cover, and one of the 3 main parachutes were recovered. All primary mission objectives were successfully accomplished. (S) (Rev. January 1969)